DAIPH. 1
500.

REPORT ON A RAPID MEDICAL & GENERAL HEALTH SURVEY OF THE SIKKIM STATE

BY

S. C. SEAL, M.B.B.S, Ph.D., D.P.H., F.A.P.H.A., F.N.I.

AND

L. M. BHATTACHARJI, M.B.B.S., D.P.H., D.T.M.

सत्यमेव जयते

FROM THE SECTION OF EPIDEMIOLOGY,
ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH,
CALCUTTA

31st March, 1954.

PUBLISHED BY THE MANAGER OF PUBLICATIONS, CIVIL LINES, DELHI.
PRINTED BY THE GOVERNMENT OF INDIA PRESS, CALCUTTA, INDIA.
1957.

Price : Rs. 5/- or 8 sh.

REPORT ON A RAPID
MEDICAL & GENERAL HEALTH SURVEY
OF THE
SIKKIM STATE

BY

S. C. SEAL, M.B.B.S., Ph.D., D.P.H., F.A.P.H.A., F.N.I.

AND

L. M. BHATTACHARJI, M.B.B.S., D.P.H., D.T.M.

FROM THE SECTION OF EPIDEMIOLOGY
ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH
CALCUTTA

31st March, 1954.

PRINTED BY THE GOVERNMENT OF
INDIA PRESS, CALCUTTA, INDIA, 1957.

PREFACE

The methodology for conducting an integrated general health survey of a community, as evolved in the Department of Epidemiology of the All India Institute of Hygiene and Public Health, Calcutta enabled us to carry out the survey of the medical, health and socio-economic conditions of the state of Sikkim within the time allotted for the purpose. The report has been divided into 8 chapters excluding the appendices, and the subjects dealt with under each, have been given in the contents. A detailed summary of the results obtained in this survey has been presented in Chapter VII with view to give a fairly comprehensive idea to those who would not be able to go through the whole report. The reader's attention is particularly directed to Chapter VI which deals with the problem of health and disease in the state. It may, however, be mentioned here that in a rapid survey like this, the various figures derived can at best be the nearest approximation to the actuals.

In the last chapter certain measures have been suggested to deal with the main health problems that were found to be seriously affecting the economy of the state, and a plan for the future medical and health organisation in the state has been outlined on the basis of the survey data. In this connection it may be emphasised that it is always better and profitable to base the health measures as well as services on the results of a survey which permits the planner to crystallize the problems and to determine their priorities. The authors' endeavour to publish this report would be amply justified, if it succeeds in stimulating interest in similar surveys being undertaken elsewhere and serves as a guide for conducting them.

S. C. Seal.

CONTENTS

CHAPTER IV—*contd.*

CHAPTER V.

CHAPTER VI.

CHAPTER VI—*contd.*

CHAPTER VII.

CHAPTER VIII.

REPORT ON A RAPID MEDICAL AND GENERAL HEALTH SURVEY OF THE SIKKIM STATE.

CHAPTER I.

Introduction.

At the request of the authorities of the Sikkim State the Government of India through its Health Ministry asked the Director of the All India Institute of Hygiene and Public Health, Calcutta, to carry out a rapid medical and health survey of Sikkim with a view to help in the planning of the future development of its medical and health organisations. Accordingly, a team consisting of the following members of the staff of the Institute proceeded to Sikkim on the 19th September 1953, and reached Gangtok, the state capital on the 22nd September, 1953, *via* Darjeeling, there being a breach in the direct communication between Siliguri and Gangtok :

1. Dr. S. C. Seal—Professor of Epidemiology,
2. Dr. L. M. Bhattacharji—Associate Professor of Epidemiology,
3. Sri K. B. Roy—Statistical Assistant,
4. Sri P. Ghosh—Laboratory Assistant

and

5. a peon.

Objects of the Survey :

The survey was carried out to obtain an integrated picture of—

(i) the state of health of the people of the state and the type, extent and distribution of the principal causes of sickness such as, malaria, kalaazar, tuberculosis, venereal diseases, parasitic infestations, diarrhoea and dysentery, small-pox and other communicable diseases,

(ii) the state of environmental sanitation such as, water supplies, disposal of night-soil, housing conditions, prevalence of insects and rodents, etc.,

(iii) the extent of immunisation against small-pox and other infectious diseases,

(iv) the state of personal hygiene and extent of ecto-parasitic infestations,

(v) the socio-economic and cultural levels of the population,

and

(vi) the existing medical and sanitary organisations of the state, so as to be able (*a*) to crystallize its main public health problems and to suggest necessary measures for their amelioration and control and (*b*) to help in the formulation of the future public health policy for the betterment of the health of the people.

On reaching Gangtok the party called on the Political Officer and drew up its programme in consultation with the Dewan, the Executive Councillor in charge of health, the Chief Medical Officer, the State Engineer and other local officials. The programme included visits to representative places of the state and getting medically examined as many persons as possible in the towns, villages, homes, hospitals, schools, bazaars, etc., within the time at their disposal, so that a representative cross-section of the population could be obtained. To ensure the co-operation of the people an appeal in the form of a leaflet was prepared and printed in English and local languages and this was distributed among the people a few days ahead of the party's arrival in a locality.

To carry out its programme the party had to undertake extensive tours throughout the state for which the state government provided them with vehicular transport wherever it could reach. For those areas where roads were not jeepable they provided ponnies and services of coolies to transport luggages and equipment. In addition to the above, the state also placed at the disposal of the party, one trained compounder, a chaprasi and two sweepers. Information was also sent in advance to the state officials of the respective areas to cooperate with the party which they all did, ungrudingly.

The actual work of the survey started from the 24th September, 1953, and lasted for nearly 6 weeks till the 3rd November, 1953, after which the party returned to Calcutta. The Professor of Epidemiology remained with the party till the 2nd October, 1953, after which the work was carried out by the Associate Professor.

The task undertaken was not easy for several reasons. The time period allotted was short and the staff available was inadequate for the purpose and the terrain was difficult. In the face of a compact programme the party had to be constantly on the alert for time which not only included that for work and movement from place to place but also for a lot of packing and unpacking and loading and unloading. Even so, it was possible to complete the work strictly according to the programme due largely to the sincerity, cooperation and perseverence of the subordinate staff of the party.

We therefore, wish to place on record the appreciation of the services of the compounder C. Karshen Thin, who rendered ungrudging assistance and of Sri K. B. Roy and Sri P. Ghosh for their continuous cooperation and assistance even under trying circumstances.

In this connexion, we also wish to express our grateful thanks to Major B. K. Kapur, the Political Officer of the state and to Sri J. S. Lal, I.C.S. the Dewan of the State and his councillors and staff, without whose cooperation, zeal, enthusiasm and lively interest this survey could not have been possible within the time allotted. Our thanks are also due to Dr. S. L. Chopra, the Chief Medical Officer who not only took personal interest in the programme but also made available to us the assistance of the hospital or dispensary staff of the place where the party worked. We are also obliged to Dr. K. V. Venkatraman, Serologist to the Government of India, School of Tropical Medicine, for kindly undertaking the examination of the blood samples for Wassermann Reaction and to Dr. M. N. Lahiri, Associate Professor of Microbio-

logy at the Institute for doing Kahn and Aldehyde tests on a few blood samples. Lastly, we are grateful to Dr. K. V. Krishnan, the Director of the Institute for his interest in the survey work.

The data collected in the field were transferred to punch cards and tabulated in the Power Samas Sorting machine in the Statistical Section of the Institute through the courtesy of Mr. K. K. Mathen, Professor of Statistics, to whom also our thanks are due. We also appreciate the help and cooperation of Sri P. M. Roy, Demonstrator of the Epidemiology Section, in carrying out the statistical calculations.

Plan of work :

(a) *Zoning of the Area :*

For the purpose of this survey the State was divided into five zones *viz.*,—

1. Central—covering Gangtok and the neighbouring villages of Burtok and Penlong,
2. Southern—comprising Singtam Bazaar, Rongpo, Duga and the villages around.
3. Western—consisting of Namchi, Chakung, Soreng Bazaar and the villages in the vicinity of each.
4. Eastern—consisting of Rhenock, Pakyong and nearby villages, and
5. Northern—in which were included Dickchu, Mangan Bazaar, Singhik, Chungthan and Lachen with one or two villages around each centre.

A list of the names of the villages surveyed in each zone with their population, as far as could be estimated locally, has been given in Appendix I. A map of the state showing the surveyed areas is also attached (Appendix II). It may be mentioned here that since the survey was a rapid one no attempt was made to adopt any sampling technique.

(b) *Procedure :*

The precedure consisted of—

(*a*) recording of medical, personal and socio-economic histories of individuals, families and villages including births, deaths and illnesses during the past 12 months and nature of diet and addiction ;

(*b*) physical examination including anthropometry and rapid nutritional assessment of both the sick and the healthy ;

(*c*) collection and examination of blood, stool, sputum and other discharges and of insects like mosquitoes, sandflies, etc.

(*d*) carrying out of tuberculin test with tuberculin PPD.

The above data were collected in three categories of schedules, namely (1) the individual, (2) the family and (3) the village, copies of which are given in Appendix VII along with their keys, in the preparation of which some guidance was thankfully received from the Dewan of the Sikkim State and his councillors.

For laboratory examinations, a field laboratory was set up wherever the necessary facilities could be made available. For this purpose, the party carried its own equipment and material. For such special examinations as the *Wassermann* or *Kahn test* of blood, which could not be carried out on the spot specimens were frequently mailed to Calcutta where these tests were undertaken either at the Institute or in the laboratory of the Serologist to the Government of India. Collection of stools presented special difficulties to us because of the inaccessibility of places in which they were passed and because of the natural reluctance of the people to collect their own stool and to bring it to us for examination inspite of being provided with clean faeces tubes for the purpose. For this reason, the stool samples of each and every individual could not be examined as originally planned. Thick and thin blood films were collected from practically all individuals surveyed. These were examined for the presence of malarial and other blood parasites. In addition, samples of blood were also tested for *Aldehyde* reaction in suspicious cases. Haemoglobin was roughly estimated by Talquist's haemoglobinometer. In a few instances, throat swabs, pus from suspected tropical ulcer and Actinomycotic lesions were also examined and confirmed in the laboratory. Tuberculin testing was done with a single dose of 0·1 ml of *5 TU PPD* and readings were taken usually after 72 hours or at least after 48 hours. This test could be carried out only in those places where the stay was programmed for more than two days. A search was also made for mosquitoes and other insects and identified in the field laboratory.

(c) *Analysis of the data :*

For the purpose of analysis of the data it was necessary to transfer the raw data from the field schedules to a new set of schedules which permitted mechanical punching and tabulation in the Power Samas Sorting Machine. For the purpose of the present report complicated correlation of different factors has been avoided as far as possible.

The various types of the above data collected in the field during the surveys have been integrated and presented in this report.

CHAPTER II.

Boundary, topography, physiography and other environmental conditions.

Area and Population :

Sikkim is a small state of 2,818 sq. miles in the Eastern Himalayas, bounded on the north-east by Tibet, on the south-east by Bhutan, on the south by the Darjeeling district of West Bengal and on the west by Nepal. The present population of the state according to the last Census (1951) is 137,725 consisting of 72,210 males and 65,515 females, the ratio between male to female being 52·4 : 47·6. Only 2,744 or 1·9 per cent of the population are urban and the remaining 124,981 are resident of the rural areas. The average density of population of the state is 50 per sq. mile. Classified according to religion the population is distributed as follows :

1. Hindus	97,863	71·96 per cent.
2. Buddhists	39,397	28·61 ,,
3. Christians	304	0·22 ,,
4. Muslims	124	0·09 ,,
5. Jains	19	0·01 ,,
6. Sikhs	18	0·01 ,,

The Hindus and the Buddhists constitute the bulk of the population the former being three times as many as the latter.

Topography and Physiography :

The whole state is situated at a considerable elevation within the Himalayan mountain zone, the ranges that bound it on three sides form a kind of horse-shoe. The state forms the catchment area of the head waters of the river Teesta which rises in the mountains in the northern part of the state near Kanchenjunga, one of the loftiest mountains in the world (28,146 ft.). This river flows directly southwards all along. Another big river, the great Rangeet, runs west-east through the state and forms the boundary between the eastern sub-divisions of Darjeeling district in West Bengal and the western part of Sikkim. Besides Teesta and Rangeet, another important river of the state is the River Rongpo which runs east to west and joins the Teesta at Rongpo. The northern portion of the country is cut into steep escarpments and except in the Lachen and Lachung valleys, it is not populated. Southern Sikkim is, however, more open and fairly well cultivated. This configuration of the country is partly due to the direction of the main drainage which is southern. The northern, eastern and western portions of the country are constituted of hard massive gneissic rocks capable of resisting denudation to a considerable extent. The central and southern portions, on the other hand, are chiefly formed by comparatively soft, slaty and schistose rocks which are easily denuded facilitating cultivation, and it is this area which is the best cultivated and the most populated in Sikkim. The general direction of the mountain system in Sikkim is from east to west. The chief ridges are the Singalils and Chela, which run more or less north to south. Another

north-south ridge runs through the central portion of the country separating the Rangeet from the Teesta valleys. The valleys cut by these rivers and their chief feeders are very deep and unhealthy. The Chela range which separates Sikkim from Tibet in the north and Bhutan in the east is pierced by the Nathu La and Jelap La passes at altitudes of 14,140 and 14,390 feet respectively. This range separates the basin of the Teesta on the west from that of Tersa on the east. The snow capped gorged ridges in the northern portion send down glaciers which, at places, come to about 13,500 ft., while those from the Kanchenjunga appear to descend at least another 1,000 ft. lower. Besides the mountains, the state has in its northern part, several lakes big or small. One of them is near Chhengu and the other near Nathu La.

Snow line :

The perpetual snow line in Sikkim may be approximately put down at 16,000 ft.

Altitude :

The altitude varies from nearly 1,000 ft. at Singtam Bazaar to about 5,700 ft. at Gangtok and 12,300 ft. at Gnatong.

Climate :

Climate varies according to the altitude. The valleys are hot and humid almost throughout the year except during the winter when it remains cool. Gangtok and elevations above 4,000 ft. are cold during the winter and bracing during the summer. In the north, at places like Lachen or Lachung, the climate is temperate with snowing in winter (Dec.—March).

Temperature :

At Gangtok, the mean maximum temperature varies from 58°F in January to 74°F in July-August, whereas at Gnatong in the north, the mean maximum temperature in January is only 37°F and that in July is 56°F. Similarly, the mean minimum temperature at Gangtok ranges between 36°F in January and 59° in July while in the north, at Gnatong, it is 17°F in January and 42°F in July.

Rainfall and Humidity :

There are rainfall recording stations at (i) Gangtok (temperature also), (ii) Namchi, (iii) Pemayangtso, (iv) Timi, (v) Chakung and (vi) Lachung. The rainfall varies in different regions. Thus the average annual rainfall is 137" at Gangtok, 80" at Namchi, 114" at Pamayangtee, 94" at Timi, 73" at Chakung, 64" at Lachung and 170" at Gnatong. The main precipitation occur during the months of May to September in regions below 6,000 ft. and from March to September in regions above this elevation. Besides the monsoon rains, there are winter rains as well, mainly in December and February. In the north, the distribution of the rainfall is more uniform, the average varying between 5" and 10" in all the months from March to September, with two maximum, one in April when the average fall amounts to 6" and the other in July when it is 10". In Gangtok the distribution of rainfall is not so uniform,

the major part of the total rains falls during the monsoon months from June to September, July and August being the wettest. Heavy falls are much more frequent at Gangtok and the regions below, where the atmosphere remains humid throughout the year, the relative humidity never going down below 75 per cent in any month.

Approach and Communications :

Gangtok, the capital of the state, is directly approachable by all weather metalled road from Siliguri in the district of Darjeeling in West Bengal. Through this town passes northwards the main caravan trade route to Tibet *via* the Nathu La pass. As such the Bazaar of Gangtok is a busy and prosperous trading centre. Another caravan route leads from Gangtok to Giagong in Tibet *via* Lachen and Chhangu. The capital of the state is also connected with jeepable roads with southern, eastern and western sections of the state but some of these roads were found to be in bad state of repairs and jeepable only with difficulty. Beyond Gangtok, towards the north, the road to Lachen is now motorable up to Dikchu which lies at a distance of 13 miles from Gangtok towards north-west. Thereafter, the road is only negotiable by ponnies or on foot. Other main roads in the state are :—

1. Siliguri—Teesta bridge—Gangtok *via* Rangpo and Singtam Bazaar.
2. Singtam Bazaar—Namchi *via* Timi, towards the west.
3. Namchi—Naya Bazaar—Chakung—Soreng Bazaar, in the west.
4. Namchi—Geyzing in the west.
5. Soreng Bazaar—Damthang, also in the west.
6. Rangpo—Naya Bazaar *via* Melli towards west.
7. Rangpo—Rorethang Bridge—Rhenock or Rongli in the east.
8. Rhenock—Rorethang Bridge—Pacchikani and Pakyong in the eastern zone.

Of these, barring the Soreng Bazaar—Damthing road all others are more or less jeepable except during heavy rains.

The villages which are scattered on hill sides are connected with each other or with the main centres by mule tracks or narrow hill paths. The presence of a large number of hill streams or rivers is a great hindrance to communications but many of these have been overcome by building wooden hanging or even concrete bridges, some of which are so narrow that only a jeep or land-rover can just manage to pass. There are also bamboo bridges across the Teesta or other streams for inter-village communications. Gangtok is telegraphically connected with Kalimpong, the line passing through Rhenock. Important centres like Namchi, Soreng, Mangan and Singtam Bazaars, Rangpo and Rhenock are served by post offices and the last three with telegraph connections as well. There are also wireless operating stations at Chungthan and near the Nathu La. The state runs its own transport services but private services are also allowed.

Fauna :

The state has a wide variety of wild animals like bears, deers, leopards, panthers, Tibetan gazelle, woolly hare, etc. They were not encountered anywhere in our tours. Various species of insects and butterflies were seen. Among other insects, mosquitoes like *A. miimus* was plentiful in Singtam and Rangpo areas, while *culicines* and *Aedea* were encountered even in

ngtok town. House and the blue bottle flies were also seen everywhere. Among rodents *R. rattus* was the main rat species. Many houses were also infested with *Mus. musculus.* Arthropods like *Blata orientalis* (cockroaches) were also seen in many houses.

Vegetation and Flora :

The state is very rich in its forest wealth which includes fir, oak, chestnut, fig, birch, magnolia, rhododendron, sal, sishu, bamboos and canes, etc. There are nearly 40 different species of flowers including all English varieties like primulus, orchids and ferns which were in abundance. Besides the above, medicinal plants like Artemesia, Ephedra, Digitalis and Ipecacuhana grow wildly in the state and are likely to form a source of revenue if properly exploited.

In the Singtam and Rangpo areas, there is a dense growth of a shrub called Assam-lata which originally came from Assam. This is popularly believed to be associated with the prevalence of Kala-azar in the state. At any rate, the appearance of this disease in the state might have coincided with the introduction of this plant. This point has been discussed along with our description of the Kala-azar problem (See Chapter VI).

Hot Spring :

There are several hot springs in the state *viz.*. (1) Phut Sachu—on the side of the Rangeet river, 2 miles north-east of Rinchinpong monastery, (2) Ralong Sachu—on the west bank of the Rangeet river, (3) Youmthang—on the east bank of the Lachung river, 1½ miles below Youmthang, (4) Momay—about 16,000 ft. above the sea, a mile below Kanchenjunga glacier. It is not known whether these are utilised by the public in the treatment of any diseased condition.

Soil and Sub-Soil :

As no reliable survey of the soil has been done, it is difficult to know about its type and pattern, but these may be similar to that of Darjeeling where in the terai region the soil is of sandy alluvium type while in the hills it is composed of black, red and white varieties. Of these, the black soil is the richest for agriculture, the white the poorest, and the red occupies an intermediate position. In most of the places the sub-soil water level is high which keeps the surface moist and allows the growth of rank vegetations.

Irrigation :

Although the state is favoured with abundant rainfall which helps in cultivation a certain amount of irrigation through open field channels from springs or streams is also employed, particularly during the period of scanty rainfall. This method results in water-logging which serves as a source of breeding of malaria carrying mosquitoes in the lower altitudes in particular.

Villages :

The total number of the villages in the state is 99 according to the last census report. Of these, 52 were visited by us, 3 from the central zone, 17 from the southern, 18 from the western, 8 from the eastern and 6 from the northern zones. Six or (10·5 per cent) of these villages were below 1,000 ft., 10 or 19·3 per cent were below 2,000 ft., 14 or 26·9 per cent were below 4,000 ft., 19 or 36·5 per cent were below 6,000 ft., 2 or 3·8 per cent below 8,000 ft., and only 1 or 1·92 per cent below 10,000 ft. The climate is mild (tropical) in 27 or nearly 52 per cent villages, moderate (sub-tropical) in 24 or 46 per cent and severe (temperate) in only 1 village. Only 5 or 11·5 per cent of those villages were situated in the zonal headquarters, 31 or 59·6 per cent were within 5 miles and the rest or 28·9 per cent were beyond 5 miles of these headquarters. They were approachable either directly by jeepable motor road or through bridal paths. Only 19 or 36·5 per cent of them could be approached by metalled or non-metalled jeepable road, and the rest by mule track or hill path.

Twelve of the villages and the Gangtok town *i.e.* (25%) of the villages visited had post offices, four of them with telegraphic communication as well. 10 or 19·3 per cent were served by the mail runners, while 29 or 56 per cent had no postal facilities.

Types of Villages :

The houses are all scattered home-steads except in the bazaars which are inhabited mainly by the Marwari and other Indian traders who live in their shops, and by the local Newars and a few others. Only in the Lachen and Lachung areas the villages were compact and clustered with no proper bazaar.

Housing :

The total number of occupied houses in the state according to the last census (1951) is 24,411. Of these 23,716 are rural and 695 urban. The average number of houses per sq. mile is 9 according to the last census (1951). The houses are either wooden or thatched, usually built on a stone plinth. They are either single or double storied having wooden floors. Each has a compound or courtyard of its own. Bhotiya (Sikkimese) generally live in double storied houses, the upper floor providing the kitchen, the bed room and a combined prayer and guest room, particularly in Buddhist families. All except the poor live upstairs. Cattle, pigs, poultry and agricultural equipment are in the ground floor. Nepalis, on the other hand, prefer to live downstairs with their animals around and store their agricultural products upstairs. Some of the houses are only huts with thatched and tinned or tiled roofs with not much of either light or ventilation. The courtyard and the ground floor in some houses remain dirty and unclean due to the keeping of pigs, cattles, poultry and goats. Such conditions in the lower altitudes facilitate breeding of sandflies, harbour mosquitoes and other insects which not only cause annoyance but also propagate diseases like, malaria, kala-azar, etc.

Of the 247 houses surveyed, information regarding their nature was collected for 222 houses. Of these, nearly 60 per cent were thatched huts, 31·1 per cent with tinned or tiled roof and wooden wall and 2·7 per cent were pucca houses and the remaining 6·3 per cent were of other types.

Water supply :

The source of water in the state is either surface water from rivers or ground waters from springs. These are in abundance throughout. The water for drinking is not treated or filtered in any way. They are directly led from their sources either in galvanised or bamboo pipes to the reservoirs or taps. Besides Gangtok, piped supplies were seen at Namchi, Rangpo, Rhenock, Soreng Bazaar, Pakyong, Mangan Bazaar and Dikchu. In these places, however, individual houses are not connected with water pipe except in the Gangtok town and in Namchi and Rangpo dak-bunglows. In all other areas the water is drawn either from covered reservoirs with taps or from isolated water taps provided in the bazaar areas. In Gangtok, water from a nearby spring is led into a covered collection chamber which feeds two distribution chambers, one for the bazaar area and the other for the palace, residency and the areas around. From these reservoirs water is carried by pipes to many of the houses in the town. It is understood that with the present growth of the town these reservoirs are already being considered insufficient. In 47 of the localities surveyed water supply is mainly from the public taps and in the remaining 5 both public and private supplies exist. The distribution of water in 6 or 11·5 per cent of these villages is through pipes, in 42 or 80·7 per cent it is obtained directly from the springs, in 3 or 5·8 per cent it is collected from the rivers or lakes and only in one both spring and rain water is used. There is acute shortage of water supply in places like Chakung in the west and Pakyong in the east during the winter.

Disposal of Night Soil :

Except in the few places mentioned below there is no arrangement of family or public latrine and as such the people go about in the fields for defaecation thus polluting the soil indiscriminately which results, as will be seen later, in heavy infestation with helminthic parasites. However, in the town of Gangtok and places like Namchi, Rangpo, Singtam, Rhenock which have bazaar, pail or bucket system of latrine is used and the disposal of night soil is mainly by the hand-removal system through sweepers. In Gangtok, Singtam, Namchi and Rangpo bazaars there are public latrines as well. Only the C.P.W.D. Bunglow at Rongpo is fitted with septic tank latrine. In Gangtok night soil is incinerated along with refuse, while in other places these are simply dumped in the valleys or jungles without any treatment. Thus fly breeding is enormous and flies like Musca, Blue bottle, Sarcophega were seen almost everywhere.

CHAPTER III.

Anthropometry :

There are several communities coming from different racial stocks now inhabiting the Sikkim state. It was therefore of interest to examine their heights and weights to find out how far these varied according to race, climate and physiography. These were recorded for almost all individuals examined by us. They enable us to draw only a general picture of their physical development.

Age, sex and weight in different communities :

Table I gives the average weights of persons in the different age groups by sex and communities.

It will be seen that a distinct difference in the weights of the two sexes in different communities exist. There has been a regular increase in weight up to the age of 25 years in both the sexes, except in one or two instances which might have arisen from the smallness of the samples. This increase in weight becomes more marked between 12 to 18 years, the adolescent period (age groups 3 and 4), irrespective of communities, except in the case of Tibetan females in whom it is rather earlier. The figures for the age groups 0-4·9 years is not strictly comparable among the communities due to relative differences in the ages of infants and children who form the group, and to the difference in their proportional distribution in different communities. It is interesting to note that the male children between 5—10 years of all communities except the Lepchas are found to have more or less similar weights but with increase in age this pattern of growth show considerable changes. Thus, the average weights of adult Nepalis are the lowest and their growth practically remains stationary after the age of 35. Similar is the case with the Lepchas. As regards other communities the average weights are, on the whole, higher than those referred to above. In this respect the average for the Marwaris and the Sikkimese does not differ much. (See Figures 1 and 2 and Appendix VIII).

TABLE I.

Distribution of Average weights (in Pounds) of persons in Various Age Groups According to Communities and Sex.

Serial No.	Age group.	Males.						Females.					
		Nepalis.	Sikkimese.	Lepcha.	Tibetan.	Marwari.	Other Indians.	Nepalis	Sikkimese.	Lepcha.	Tibetan.	Marwari.	Other Indians.
1	0—4·9	23·9	22·5	—	—	24·2	7·5	21·5	16·5	20·8	27·5	20·0	—
2	5—9·9	39·8	40·0	50·6	43·3	38·6	40·4	38·9	43·1	43·4	39·2	30·4	38·2
3	10—14·9	55·2	53·4	65·6	66·0	63·0	51·1	63·8	61·1	65·6	87·0	49·2	60·5
4	15—19·9	90·4	85·2	95·0	103·7	110·3	98·3	90·1	95·4	103·0	103·8	—	85·8
5	20—24·9	98·3	110·0	112·5	111·7	121·7	120·0	97·3	103·3	105·0	97·5	105·0	—
	25—29·9	103·7	119·8	117·5	97·5	109·2	92·5	89·6	113·8	—	105·0	—	92·8
7	30—34·9	99·0	120·0	125·0	125·0	115·0	96·3	100·7	114·2	120·0	—	97·5	—
8	35—39·9	117·7	146·4	112·5	—	141·7	119·2	75·8	101·7	—	—	—	—
9	40—44·9	113·6	155·0	118·1	—	118·3	67·5	86·1	192·5	105·0	—	—	—
10	45—49·9	111·3	115·0	105·0	—	150·0	145·0	90·8	115·0	97·5	115·0	—	—
11	50—54·9	123·3	125·0	170·0	—	115·0	113·3	94·6	125·0	—	—	—	—
12	55 & above	120·7	131·7	117·5	—	135·0	—	86·3	95·0	90·0	—	105·0	—

TABLE II.

Distribution of Average Heights (in Inches) of persons in various Age Groups According to Communities and Sex.

Serial No.	Age groups.	Males.						Females.					
		Nepalis	Sikkimese.	Lepcha.	Tibetan.	Marwari.	Other Indians.	Nepalis.	Sikkimese.	Lepcha.	Tibetan.	Marwari.	Other Indians.
1	0—4·9	38·9	32·3	—	—	33·8	23·8	29·9	27·8	30·0	33·8	33·8	—
2	5—9·9	43·3	40·2	47·8	43·8	43·4	41·9	42·7	44·0	44·0	41·5	44·1	44·1
3	10—14·9	45·3	49·9	52·8	52·1	54·4	50·8	51·8	43·3	52·1	55·2	50·4	53·3
4	15—19·9	59·3	58·1	60·4	63·2	63·4	61·3	57·6	57·7	58·3	56·3	—	61·3
5	20—24·9	60·8	62·1	61·3	64·6	67·6	67·6	57·6	60·0	60·0	62·8	58·8	—
6	25—29·9	61·0	63·8	61·3	58·8	67·1	61·3	55·8	60·0	—	58·8	—	56·3
7	30—34·9	60·4	64·4	63·8	63·8	61·3	61·3	57·3	62·9	60·0	—	58·8	—
8	35—39·9	63·8	62·0	61·3	—	66·3	63·8	57·9	59·6	62·5	—	—	—
9	40—44·9	63·3	65·0	62·5	—	65·4	61·3	56·3	61·3	63·8	—	—	—
10	45—49·9	62·9	62·9	56·3	—	66·3	66·3	58·8	51·3	56·3	63·8	—	—
11	50—54·9	62·9	62·3	61·3	—	66·3	65·4	58·8	59·4	—	—	—	—
12	55 & above	62·1	61·3	63·1	61·3	61·3	—	50·3	57·1	57·7	—	61·3	—

Similar trend is also seen in the females, amongst whom the Nepalis have the lowest average weights. Even so, the Nepalis of both sexes show higher average weights than those of the people in the Singur area (West Bengal).

Comparing the two sexes the females have generally lower average weights than the males of the corresponding age groups except that between 10-14·9 years. This difference in weights among the two sexes is, however, minimum in case of the Sikkimese women whose average weights are better than others. On the whole, the average weights for different communities in Sikkim compare favourably with those of the rural population of West Bengal.

Age, sex and height in different communities :

The distribution of average heights by age groups in different communities is given in Table II.

Amongst males, those of Indian origin, like the Marwaris, show the best average heights in all age groups. Amongst the indigenous communities the Sikkimese and Tibetans are found to be slightly taller than the Lepchas and the Nepalis. After the age of 35 years the heights did not vary much. On the whole, adult males of the Lepchas have the lowest height.

Adult females, as a whole, show lower heights than the corresponding males but for the age group 10-14·9 years this is more or less reversed. Among the different communities, the Nepali females have the shortest stature in comparison to the Lepchas, Sikkimese and Tibetans whose average heights more or less approximate one another ; Marwaris and ' other ' Indians occupy an intermediate position. As in the case of average weights the period of greatest development in respect of height in all communities is also in the period of adolescence (12 to 18 years). (See Figures 3 and 4 and Appendix VIII).

CHAPTER IV.

Socio-Economic Conditions.

Political history and administration of Sikkim.

The original inhabitants of Sikkim were the Lepchas or as they call themselves Rong pa (ravine folk), an ancient tribe of mongolian extraction migrating from the South Tibet. The reigning family from the beginning had probably been a Tibetan and the culture and tradition of the state were bound up largely with those of the Great Plateau. Buddhism does not appear to have been introduced into Sikkim until as late as the 17th century, previous to which the people were mostly Animists. With the introduction of Buddhism by the reforming party of Tibet and the founding of monasteries and temples thereafter the tangible history of Sikkim really began. The Sikkim Buddhists referred to the Dalai Lama on all important secular matters and the rulers allied themselves matrimonially with the Tibetan families. But, at the beginning of the 19th century troubles started in Sikkim with clash of interest with the neighbouring state of Nepal, which was settled by the British Government in favour of the former. This led to the treaty of Titalaye in 1871 by which the independence of Sikkim which the Gurkhas had begun to menace was guaranteed and the settlement of Nepalis in the state prevented. In 1889 the aggression of the Tibetans led to a war which was succeeded by the active intervention of the Indian Government. A Political Officer was appointed, the communications were greatly improved by the construction of roads and bridges, and the settlement of Nepalis which was so long prohibited was also allowed at selected places in the state. Since 1891, there has been a tremendous increase in the Nepali population, so much so, that they now form the majority community. The same period also saw a great extension of cultivation.

After the Indian independence of 1947, the Sikkim Durbar made a fresh treaty of friendship with India whereby the Government of India assumed responsibilities for its (1) Defence, (2) Foreign Affairs and (3) Communications. In all other matters the state is independent with the Maharajah at the head of its administration. He is assisted by the Dewan who is a member of the Indian Civil Service and has been deputed by the Union Government. Since 1952, parliamentary system of government has been introduced and extensive land reform carried out in the state. The state has now its own parliament of 16 councillors, 12 of whom are elected by the people and 4 nominated by the Maharajah. The Dewan, as the representative of the Maharajah, presides over the meetings. Two of the elected councillors, one belonging to the Bhotiya community and the other, a Nepali, have been selected by the Maharajah as Executive Councillors to hold charge of the transferred subjects, *viz.* (1) Education, (2) Medical Relief and Public Health, (3) Excise, (4) Forests, (5) Roads and Buildings, (6) Transport, etc. All other subjects are directly under the control of the Dewan who is in overall charge of the administration including Law and Order, Home and Finance.

For administrative purposes Sikkim has been divided into two sub-divisions, *viz.* (1) Gangtok and (2) Namchi. These are under the charge of Tehsildars who have sub-tehsildars under them, posted at different areas. The main function of the Tehsildars is collection of revenues which they do through village officials called mondals. The Tehsildars have also some executive function to performs. In addition, the forest rangers have also been vested with some magisterial and executive powers by which they try and impose fines upto a certain amount. There is also a High Court in the State under the charge of a Chief Justice who is assisted by another judge. In addition there are Courts of Magistrates in Gangtok to deal with criminal and other cases.

Revenue :

The total revenue of the state amounts to Rs. 21,00,000 chiefly derived from customs, excise, sales tax, income tax, transport and sale of forest products and exports of oranges, apples, potatoes, etc.

Population, Race and Nationality.

The indigenous population of the state is composed of the Nepalis, Sikkimese Bhotiyas, Lapchas and the Tibetans. Of them the Lapchas or the Rongs are the oldest and the original inhabitants of the state but are now being gradually displaced by other races. Next in order of importance and antiquity comes the Bhotiya who migrated from the Tibetan province of Khams. The Limbus who are also of Tibetan stock migrated from the Tibetan province of Tsang, south of the Tsanpo (Brahmaputra). The Nepalis who now form the majority of the present day population of Sikkim are recent arrivals, from beyond *the Arun* in Nepal. Climate being healthy, epidemics absent and people having a high birth rate there was a phenomenal increase in the Nepali population between the year 1891-1901. This increase received some set back during the period 1911-1921 because of the pandemic of influenza and local epidemics of Relapsing fever and Kala-azar. The Buddhists have a caste-less society but the Nepalis are sub-divided into several castes and sub-castes according to their origin. Thus, among those of Indian origin come the (i) Brahmins, (ii) Chettris, (iii) Sannyasis, (iv) Kami, (v) Damai and the (vi) Sarkis, the last three being considered as scheduled castes. All other Nepali tribes and castes, *viz.*, the Rais, Limbus, Gurungs, Mangars, Tamangs, Newars (Prodhans), Sunwars and the Sherpas are of Mongoloid or indigenous origin.

In addition to these indigenous races there are the Marwari and Bihar traders and a few Punjabees, Bengalees and people from the west coast of India who work as teachers, officials and soldiers. The only European that we came across was the Head-mistress of Gangtok Girls' H.E. School. Besides above the floating population which comprises the traders and beggars from Tibet, tourists and officials from India is not inconsiderable. In this respect, Gangtok, Rhenock, Mangan and Dikchu, lying as they do on the routes to Tibet, draw a large number of these traders and consequently have some floating population. This is particularly seen in Gangtok, which has the highest floating population.

Altogether 1,700 persons were examined during this survey. Age and sex composition according to zones has been given in Appendix III. The proportion of males to females was found to be 1·55 : 1, whereas the corresponding proportion in the census population is 1·1 : 1. The list of villages with their approximate populations according to zone has been given in Appendix I. The percentage of population examined in the various zones are 7·8 in the central, 5·5 in the southern, 5·7 in the western, 4·7 in the eastern and 12·3 in the northern zone, average being 6·2 per cent.

The indigenous population of the state, although belonging to various stocks or races, can be classed as communities rather than nationalities in a stricter sense. The distribution of these various communities in different zones is given in Table III.

TABLE III.

Distribution of sample population according to communities and zone.

Communities	ZONE							
	Central	Southern	Western	Eastern	Northern	Total	Percentage	% Census (1951)
Nepalis including Sherpas	193	246	358	115	4	916	54·9	68·2
Bikkimese including Bhotiyas	92	35	54	44	41	266	15·9	11·4
Lepcha	118	5	26	35	38	192	11·5	10·0
Tibetan	82	9	0	3	8	97	5·8	..
Marwari	15	35	55	7	4	116	11·9	10·4
Other Indians	36	16	26	4	0	82		
Not known	8	0	3	20	0	31	..	..
TOTAL	544	346	522	198	90	1700	..	..

The percentage distribution of communities in the population as obtained in 1951 Census in the whole of Sikkim is shown in Table III against those obtained in the present survey. It will be seen that as in the Census the Nepalis showed the highest proportion. As regards other communities the proportions among the sample population of Sikkimese was higher but for all others there was not much of difference.

Race and Religion.

Hinduism and Buddhism are the two main religions prevalent in the state. The Maharaja himself is a leading member of an ancient Buddhist royal family. The Maharaj-kumar is the president of the Mahabodhi Society of India. Buddhism is the religion of the Tibetans, Sikkimese and majority of the Lepchas. The Nepalis are predominantly Hindus except the Tamangs, the Sherpas and the Limbus many of whom are Buddhists. There are also a fair number of Christians particularly among the Lepchas, and a few Jains, Sikhs and Muslims. The last named are mostly Biharis and are concentrated in Gangtok. The distribution of religion among the sample population has been shown against that of Census population in Table IV.

TABLE IV.

Distribution of the sample and census populations (1951) by sex and religion.

Religion	Sample Population				Both Sexes		
	Male		Female		Sample population.		Census population
	No.	%	No.	%	No.	%	%
Hindus	615	61·7	376	57·31	991	60·0	71·08
Buddhists	331	33·2	235	35·82	566	34·3	28·61
Christians	38	3·8	31	4·72	69	4·12	0·22
Jains	7	0·70	5	0·76	12	0·72	0·01
Sikhs	0	0·0	2	0·30	2	0·12	0·01
Muslims	5	·50	6	·91	11	0·66	0·09
Others	0	0·0	1	0·15	1	0·06	—
N. K.	38	—	10	—	48	—	—
TOTAL	1034	..	666	..	1700	..	..

Educational and cultural Facilities.

Education is a transferred subject under an executive councillor. There are only 2 High Schools in the whole of the state, one for boys and the other for girls. Both are in Gangtok and are affiliated to the Board of Secondary Education, West Bengal. The boys' school, established 27 years ago, is a full-fledged government institution but the one for the girls has been functioning for about 7 or 8 years and is run by a Scottish Mission with state aid. This

school is ideally situated and has one of the best buildings in the state with clean, airy and well lighted class rooms. The girls also are very well looked after. The total scholars in these two schools at the time of survey was 675, 375 in the boys and 300 in the girls school. They are drawn from all over the state. Both these schools have attached hostels for residential scholars and teachers. At present there are 50 boarders in the boys' and 16 in the girls' hostel. Although the school children represent a special class and have their own health problems they are not entirely divorced from the local health condition which they often reflect. Hence, we made it a point to examine them wherever possible. Other schools in the state are either primary or middle, run by Christian Missions or private bodies. The only aid they receive from the state is in the shape of small grants amounting to Rs. 60-80 p.m. as the case may be.

School Health and Sanitation.

Besides the two schools at Gangtok as mentioned above, other schools visited by us were at (1) Singtam Bazaar, (2) Sumin, (3) Timi, (4) Namchi, (5) Soreng Bazaar, (6) Chakung and (7) Pakyong. Except in Gangtok, the buildings are unsatisfactory, and the class rooms are dark, ill-ventilated and crowded. In some schools, *viz.*, those at Namchi, Chakung, Soreng Bazaar and Pakyong buildings require immediate attention. Another common defect observed in all these schools was the complete lack of facilities for drinking water, latrines and urinals within the compounds or within easy reach of the scholars. Students ease themselves wherever they like and consequently there is universal soil pollution. There is also no arrangement whatsoever for keeping the rooms warm during winter. The average number of scholars in these schools vary from place to place. In areas like Namchi, Chakung, and Soreng Bazaar, the number averages 100-120 while in smaller areas, the number is below 100. It is often as low as 20-30. It was also observed that in several schools, as for instance, in those at Namchi and Pakyong, the freshers and young scholars had no benches to sit on, or tables or desks to write. In most of the schools in the state, graduate, or otherwise trained teachers were few. Although hygiene is included in the curriculum in some of the schools, as at Gangtok, Namchi, Soreng Bazaar, there is no trained teacher available for teaching the subject. This is often relegated to the teacher in charge of physical education which included drills and games like foot-ball. Health practices are neither insisted on, nor generally observed. Consequently such conditions as caries, pediculosis, scabies and worm infestations were quite common among these children everywhere. The diet as supplied in the hostels was found to be inadequate for the scholars considering their growing age period. For collegiate and technical education, the state has no facilities. Students have to go to Kalimpong, Darjeeling and Calcutta for this purpose, either at their own cost or at state expense.

Literacy.

The extent of literacy among the population surveyed in different zones by sexes is given in Table V. A person capable of reading and writing in any language was considered as literate.

TABLE V.

Distribution of literacy (including just literates) by zone and sex.

Zones		Male				Female				Both Sexes			
		Illiterate	Literate	Not known	Total	Illiterate	Literate	Not known	Total	Illiterate	Literate	Not known	Total
Central	No.	54	263	1	318	75	151	0	226	129	414	1	544
	%	17·3	82·7	..	..	33·2	66·8	..	..	23·8	76·2	..	..
Western	No.	97	252	3	352	113	52	5	170	210	304	8	522
	%	27·8	72·2	..	..	68·5	31·5	..	..	40·9	59·1	..	..
Southern	No.	99	94	3	196	131	17	2	150	230	111	5	346
	%	51·3	48·7	..	..	88·5	11·5	..	..	67·4	32·6	..	..
Eastern	No.	49	67	0	116	58	24	0	82	107	91	0	198
	%	42·2	57·8	..	..	70·7	29·3	..	..	54·0	46·0	..	..
Northern	No.	31	20	1	52	34	4	0	38	65	24	1	90
	%	60·8	39·2	..	..	89·5	10·5	..	..	73·0	27·0	..	..
TOTAL	No.	330	696	8	1,034	411	248	7	666	741	944	15	1,700
	%	32·2	67·8	..	..	62·4	37·6	..	..	44·0	56·0	..	..

Literacy By Zone and Sex.

In the surveyed population 56 per cent were literate, males predominating (67·8 per cent) over females (37·6 per cent). These figures are a little high because of the large number of school boys and girls being included in the survey. Even so, good deal of difference was noted in different zones, the rates arranged in order being 76·2 per cent for the central, 59·1 per cent for the western, 46·0 per cent for the eastern, 32·6 per cent for the southern and 27·0 per cent for the northern zones. There is a wide gap in the rate of literacy between the males and the females, particularly in the western, southern and eastern zones. In the northern zone, however, literacy in both sexes is the lowest.

Literacy By Age and Zone.

Table VI shows the distribution of literates (including just literates) in different zones by age groups. It is true that the sample population below the age of 25 years included a large number of school children for which the higher rate of literacy was obtained but the same can not be said about the higher age-groups.

TABLE VI.

Distribution of literates (including just literates) by zone and age group.

Age Groups	Central		Southern		Western		Eastern		Northern		All Zones	
	No. Examined	% Literate	No. Examined	% Literate	No. Examined	% Literate	No. Examined	% Literate	No. Examined	% Literate	No. Examined	% Literate
0—4·9 .	37	0·0	33	0·0	37	13·5	15	0·0	4	0·0	126	4·0
5—14·9 .	286	90·1	115	53·0	249	75·1	68	4·8	25	32·0	743	75·1
15·-24·9 .	121	87·6	65	27·7	99	56·6	39	56·4	19	21·1	343	60·1
25 and above	99	48·5	128	25·0	128	43·8	76	35·5	41	29·2	472	37·1
All age groups.	543	76·2	341	32·6	514	59·1	198	46·0	89	27·0	1,684	56·0

Even so, the rates of literacy among the higher age-groups were as high as 48·5 per cent in the central, 25·0 per cent. in the southern, 43·8 per cent in the western, 35·5 per cent in the eastern and 29·2 per cent in the northern zone, average for all zones being 37·1 per cent which is much higher than the figure (17·7 per cent) obtained for the whole of West Bengal in 1951 Census. Thus, literacy mainly traditional, was higher in the central and the western zones which included important centres like Gangtok, Namchi, Chakung and Soreng Bazaar. Notwithstanding this high rate it may be mentioned here that no public library existed anywhere including Gangtok. Newspaper reading is also limited to a few. One of the reasons probably is the absense of newspaper is one of the local vernaculars.

Religious Institutions and Community Festivals.

Durga and Lakshmi Pujahs are performed in nearly every Nepali Hindu home during the Dusserah which is their national festival and a day of universal rejoicing for the relatives and friends to meet and exchange greetings with each other. Pujahs, ceremonial sacrifies of goats or buffaloes, feasting and drinking form a part of these ceremonies. Other important festivals in the state are the *Magh Sankrant* in January at Singtam, Rangpo, Rorethang and Tribeni for the Hindus, *Losum* and Tibetan New Year's day in December-January for the Buddhists. All these festivals draw big crowds from the neighbouring villages into the bazaar centres for purposes of amusements, drinks and purchases. At few places there are Hindu temples for communal worship. No history of epidemic arising from such congregations could be elicited.

Buddhists in Sikkim are, however, more orthodox with their religion and rather scrupulously observe their religious customs and laws. There would be no Buddhists' village without a "Goompha" (monsatery) and hardly a Bhotiya Buddhist house without a prayer room. These monasteries are built in specially selected places and are scattered widely throughout the state. A monastery may have single or double-storied structure with other additional buildings for monks, kitchen, etc., and a yard for dancing and community feasting. Another characteristic thing in a "Goompha" is the number of prayer wheel (Mani) with printed scriptures wound round them. It is believed that twirling of these wheels brings them piety. The main building consists of a central hall, dimly lit with rows of lamps burning, temple drums and holy water vessels and the alter at the furthest end with the images of the Trinity. This hall is often fairly decorated and the rich *goomphas* have a large number of holy books and scriptures kept well preserved in the pigeon holes made for the purpose. These monasteries also serve as centres of education on traditional lines. These as well as the Buddhists homes can be easily recognized from a distance by the varied number of white prayer flags attached to long bamboo poles.

Buddhists generally have devil dance in the courtyard to ward off demons and there is another kind of dance held in certain seasons to celebrate the worship of the spirit of Kanchenjanga. He is invoked as the war god of Sikkim. This dance is said to have been devised by the Maharaja Chagdor Namgyal, (who also invented the Lepcha alphabet) and is performed not only

TABLE VII.

Nature and distribution of addiction in different communities and sexes.

Nationality		MALE						FEMALE						BOTH SEXES					
		Nil	Alcohol	Tobacco	Opium	Other	Population	Nil	Alcohol	Tobacco	Opium	Other	Population	Nil	Alcohol	Tobacco	Opium	Other	Population
Nepali	No.	112	136	162	1	—	288	105	102	137	8	—	251	217	238	299	9	—	539
	%	38·9	47·2	56·2	0·34	..	..	41·8	40·6	54·6	3·2	..	..	40·3	44·2	55·5	1·7	..	..
Sikkimese	No.	33	81	66	—	—	122	28	66	55	0	0	101	61	147	121	—	—	223
	%	27·0	66·4	54·1	..	..	..	27·7	65·3	54·4	..	..	..	27·4	65·9	54·3	..	..	..
Lepcha	No.	19	53	82	1	—	72	20	36	22	0	0	56	39	89	54	1	—	128
	%	26·4	73·6	44·4	1·4	..	..	35·7	64·3	39·2	..	..	..	30·5	69·5	42·2	0·78	..	..
Tibetan	No.	7	10	7	1	2	18	5	11	9	2	2	18	12	21	16	3	4	36
	%	38·9	55·6	38·9	5·5	11·1	..	27·8	61·1	50·0	11·1	11·1	..	59·3	58·3	44·4	5·6	11·1	..
Marwari	No.	46	—	15	—	—	61	19	1	3	0	0	23	65	1	18	—	—	84
	%	75·4	..	24·6	..	..	..	82·6	4·3	13·0	..	..	..	77·4	1·2	21·4	..	..	..
Other Indians	No.	19	10	13	—	—	34	4	4	4	0	0	9	23	14	17	—	—	43
	%	55·9	29·4	38·2	..	..	..	44·4	44·4	44·4	..	..	..	53·5	32·6	39·5	..	..	..
Not known	No.	—	—	2	1	—	3	2	0	4	0	0	6	2	—	6	1	—	9
	%	..	..	66·7	33·3	..	..	33·3	..	66·7	..	..	..	22·2	..	66·7	11·1	..	..
TOTAL.	No.	236	290	297	4	2	598	183	220	234	10	2	464	419	510	531	14	4	1062
	%	39·5	48·5	49·7	0·67	0·33	..	39·4	47·4	50·4	2·2	0·43	..	39·5	48·0	50·0	1·32	0·38	

In general, addiction was most prevalent among the Sikkimese (72·6 per cent) Lepchas (69·5 per cent) and the Tibetan (66·7 per cent). The Nepalis and other Indians came next in order with the addiction rates of 59·7 per cent and 46·5 per cent respectively. It was least, 22·6 per cent, among the Marwaris. The overall rate of addiction to alcohol was 48·0 per cent and to tobacco 50·0 per cent opium addicts constituted 1·32 per cent of the population, the habit being prevalent among the Tibetans, Nepalis and Lepchas. The consumption of alcohol was highest among the Lepchas. In fact, "Rakshi" prepared from the millet seeds or buck wheat in their homes provided a common beverage for the Lepchas. It was kept in bamboo vessels and drunk through a long straw or bamboo pipe. Next to the Lapchas such drink was popular with the Sikkimese, the Tibetans and, to a lesser extent, with the Nepalis and other Indians. The Marwaris, as usual, did not indulge in any alcohol and very little in tobacco. The latter was more popularly used by the Nepalis and the Sikkimese.

The addicts were practically equally distributed between the two sexes, their prevalence being slightly less common among the females in all communities except the Tibetans and other Indians in which the females were more addicted to alchohol and tobacco than the males.

The distribution of addicts according to age and sex is given in Table VIII.

TABLE VIII.

Nature and distribution of addiction by age and sex.

Age Groups		Male						Female						Both Sexes					
		Nil	Alcohol	Tobacco	Opium	Other	Population	Nil	Alcohol	Tobacco	Opium	Other	Population	Nil	Alcohol	Tobacco	Opium	Other	Population
0—14·9	No.	171	25	30	2	—	207	153	23	30	8	—	191	324	48	60	10	—	398
	%	82·6	12·1	14·5	0·97	..	..	80·1	12·0	15·7	4·2	..	..	81·4	12·1	15·1	2·5	..	..
15—24·9	No.	23	69	75	—	1	111	15	59	72	1	1	96	38	128	147	1	2	207
	%	20·7	62·2	67·6	..	0·9	..	15·6	61·5	75·0	1·04	1·04	..	18·4	61·9	71·1	0·48	0·97	..
25—44·9	No.	33	127	126	1	1	191	8	94	88	1	1	117	41	221	214	2	2	308
	%	17·3	66·5	66·0	0·52	0·52	..	6·8	80·3	75·2	0·85	0·85	..	13·3	71·8	69·5	0·64	0·64	..
45 and above	No.	9	69	66	1	—	89	7	44	44	—	—	60	16	113	110	1	—	149
	%	10·1	77·5	74·2	1·12	..	..	11·7	73·3	73·3	..	..	..	10·7	75·8	73·8	0·67	..	..
TOTAL	No.	236	290	297	4	2	598	183	220	234	10	2	464	419	510	531	14	4	1062
	%	39·5	48·5	49·7	0·67	0·32	..	29·4	47·4	50·4	2·2	0·43	..	39·5	48·0	{50·0	1·32	0·38	..

It will be seen that addiction increased with age but there was a sudden increase from 18·6 per cent in the age group 0-14·9 years to 81·6 per cent in the age group between 15 and 24·9 years, the period of adolescence and early adulthood. Thereafter, there was only a slight rise in the rate, *e.g.*, 86·4 per cent in the age group 25-44 years and 89·3 per cent in persons above 45 years in whom it was the highest. The popularity of alcohol and tobacco would be evident from the data which show that even 12·1 per cent of the children below 15 years were also indulging in alcohol and 15·1 per cent in tobacco. Females between 15 and 44·9 years showed slightly higher percentage of addicts in respect of all the three intoxicants than the males of the corresponding age groups.

Beverages :

Besides liquor, drinking of tea either sweetened with sugar and milk or as raw infusions, are very common among all classes of people (*see* Chapter VII). The Sikkimese often add to it the butter of the cow or yak.

Occupation :

The main occupation of the people of the state is agriculture. A few are employed as state officials in the police or military and as teachers, clerks, petty traders, labourers and domestic servants. Some take to the profession of priesthood which is particularly common among the Buddhists. The distribution of principal occupations among the population surveyed according to sex is given in Table IX.

TABLE IX.

Distribution of principal occupations among the sample population according to sex.

Occupations.	Male.		Female.		Both Sexes.	
	No.	%	No.	%	No.	%
Priest	5	0·5	0	..	4	0·24
Liberal Profession	24	2·3	4	0·60	28	1·65
Landlord	6	0·6	1	0·15	7	0·41
Clerks and sedentery	18	1·7	1	0·15	19	1·12
At school	490	47·4	232	33·3	712	41·9
At home	138	13·4	299	44·9	437	25·7
Shopkeeper & Shop Asstt.	20	1·9	1	0·15	21	1·24
Cultivator	170	16·4	100	15·0	270	15·9
Traders	55	5·3	2	0·30	57	3·4
Domestic servant	16	1·6	27	4·1	43	2·5
Transport & other labour	38	3·7	6	0·9	44	2·6
Police	12	1·2	0	..	12	0·71
Military	1	0·10	0	..	1	0·06
Village Headman	1	0·10	0	..	1	0·06
Artisan	1	0·10	0	..	1	0·06
Miscellaneous	39	3·8	3	0·45	43	2·53
TOTAL	1,034	100·10	666	100·00	1,700	100·08

It will be seen from Table IX that a large number of women were employed in agriculture, but the majority were either house-wives or at school. A fair number of them was working as domestic servant and labourers. Liberal profession like teaching and nursing also claimed a few of the women. Among the indigenous people there were only a few artisans and petty traders but no sweeper, washerman, barber and cobler were seen. These classes of work were generally undertaken by the migrants from Bihar, the Punjab and other neighbouring states.

Age and Occupation :

The distribution of occupation by age in the sample population has been given in Appendix VI.

It will be seen that 20 children below 15 years were employed in cultivation and 4 were working as domestic servants.

Agriculture :

In Sikkim the most important crop is maize, which forms the staple food for the majority of its people. Though rice is grown extensively in the valleys in terraced fields, 6-7,000 ft. being the highest limit of its cultivation, the state is not self-sufficient in this cereal which has to be imported from outside. Other important cereals are millets (Kodo) and buck wheats (Phapar) which are extensively used for the preparation of a fermented liquor called *Rakshi* which forms an universal beverage of the people. In isolated places a little wheat and barley (Tsampa) are also grown. Black gram or Kalaidal, Mungdal and Potato are also cultivated. Cardamom which is extensively grown in the northern and eastern regions of the state is a cash crop and forms one of the main sources of revenue to the state. Although tea is grown so extensively in the neighbouring areas of Darjeeling and the habit or tea-drinking is common among the people, no tea garden exists within the state.

TABLE X.

Number of villages cultivating various cereal crops by altitude (Total number of villages=52).

Altitude (ft.)	Cereals.						
	Paddy.	Maize.	Millet.	Wheat.	Buck-wheat.	Barley.	Others.
1500 . . .	9	11	9	1	0	0	0
—3000	11	14	11	0	5	0	0
—5000	13	18	16	3	10	1	0
—6000	3	4	6	2	4	0	1
—8000	1	2	2	0	2	0	2
—10000 . . .	0	1	1	0	1	0	0
TOTAL . . .	37	50	45	6	22	1	3
PERCENTAGE . . .	71·1	96·1	86·5	11·5	42·3	1·9	5·7

Table X gives the distribution of the number of villages cultivating various cereal crops at different elevations. It will be seen that 50 villages or 96·1 per cent, were cultivating maize, the staple food of the people. Next popular crop is millet, which was cultivated by 45 or 86·5 per cent of the villages. These two crops were found to be cultivated upto 9,000 ft. Paddy was the next popular crop being cultivated by 37 or 71·1 per cent villages up to an elevation of 6-7,000 ft. Only 22 villages (42·3 per cent) were cultivating buck-wheat which was seen being grown upto an elevation of 9,000 ft. Only in 6 villages wheat was being cultivated upto an elevation of 5-6,000 ft. and only 1 village was producing barley.

Fruits :

In the valleys oranges are grown in plenty and are exported outside through the whole-sale market at Rongpo. Besides oranges, Sikkim is famous for its apples which are grown in plenty in the Lachen and Lachung valleys either as private or as state enterprise. Bananas are produced abundantly in the lower valleys, where tropical fruit like papayas, guavas, mangoes, jack fruits, pine-apples also grow.

Animals and Live-stock :

Cattle, pigs, goats, and poultry are reared and kept by almost all families. Some also keep sheep and buffaloes but their numbers are few. In the Lachen area cattle are rare but yaks are common. These animals supply not only milk and butter but also form the main source of proteins in the diet of the people. The yield of milk per cattle is however very poor inspite of extensive fields for pasteurage. This may be one of the reasons for the low consumption of milk by the people (*see* Chapter VI).

Diet :

Maize and rice are the chief cereals eaten. The poorer classes also take millets and buck-wheats. Grams like kalai (black) or Moong also form important items of the diet. All except, the Brahmins take meat, but the Nepali Hindus avoid pork for which the Sikkimese and Lepchas have no prejudice. In fact, pork is a more favourite dish with them than beef or mutton. A pig is the universal item of present in a marriage ceremony. Milk is drunk only with tea and sparingly as it is. In the north, the people take the milk of yak either as it is or in the form of dried cheese cubes.

Mineral Wealth :

As an economic mineral copper ores are very widespread and constitute one of the main sources of the prospective mineral wealth of the state, which is now being investigated by the Geological Survey of India. Besides copper, there is some amount of lead and iron. The latter occurs chiefly as pyrites. It is most plentiful at Bhotang where magnetite also occurs. There are beds of lime-stones in the Namchi area but it is, as a rule, too impure to yield good lime. Garnet, though abundant in the gneiss and mica schists at places does not appear to be fit for the market. In this area coal or lignite may probably also occur, for evidences of these minerals were seen in the hills on road to Namchi from Timi.

Trade and Commerce :

Marwaris practically monopolise the export-import trade of the state. They are whole-salers, retailers as well as bankers. They usually belong to the Bikaner district in Rajasthan or Hissar district in the East Punjab with which they still maintan connections. The main commodities for trade are (1) Cardamom, (2) Orange, (3) Potato, (4) Wool from Tibet and (5) Cereals and *dal*.

Markets :

There are a few bazaars or markets located in important places in the state. Of these, we visited Singtam, Namchi, Rongpo, Soreng, Rhenock, Pakyong, Dikchu and Mangan. North of Mangan there is only a few isolated shops but no bazaar. In these bazaars there are weekly *hat* days when people congregete in large numbers from neighbouring villages to sell their products and to make purchases.

Industries :

The state has no industry worth its name except a few country-distillaries which prepare spirits and liquors. These are owned mainly by the traders from outside, who act both as whole-salers and retailers. The local people make bamboo baskets and woolen drapes and wrappers as cottage industries. Arts and crafts follow Tibetan patterns.

Medical and Public Health Facilities :

This is a transferred subject under the charge of an executive councillor. It has an annual budget grant of Rs. 97,813. Of these 73,123 is spent on medical relief and Rs. 24,690 on public health. A major part of the whole budget goes towards pay and establishment charges.

The chief medical officer who is also the Agency Civil Surgeon is the administrative head of this department. He combines both curative and preventive work. For medical relief the state has 3 hospitals *viz.*, one each at (1) Gangtok, (2) Namchi and (3) Singtam Bazaar, each being in charge of a qualified medical officer who is either a medical graduate or a licenciate.

(1) The hospital at Gangtok is the biggest in the state and is situated on the main road near the bazaar. It has 60 indoor beds, separate for males and females, a small labour ward, an operation theatre, a small clinical laboratory, X-ray and diathermy plants and a tuberculosis annexe of 6 beds, which is housed in a separate building across the road. Attached to the hospital is an outdoor dispensary which operates daily in the afternoon. The hospital and the dispensary together serve a population of 15,000 people including the town of Gangtok and the neighbouring villages. It also gets patients from every part of the State. The cases treated include both surgical and medical and the average daily attendance at the outdoor number nearly 100.

(2) The hospital at Namchi is situated in good surroundings on the top of a hill. It gets the rays of the sun throughout day. It has 16 indoor beds *plus* an attached outdoor dispensary. The wards are separate for males and

females. It has a small operation theatre and a clinical side room. Minor operations are carried out by the doctor assisted by the compounders who often act also as the anaesthetist. In the laboratory, facilities exist for the routine examinations of blood, stool and urine which are done in most of the cases. This hospital and dispensary serves a radius of 5-6 miles and a population of nearly 10,000. The average daily attendance is 20.

(3) The hospital at Singtam is a 4-bedded one, situated in a double storied wooden building on the main motor road to Siliguri, on the eastern side of the river Teesta flowing down below. The outdoor dispensary and the doctor's examination and operation rooms and the laboratory are in the ground floor while the ward is placed in the first floor. The laboratory examinations are mainly carried out for stool, blood parasites and aldehyde test. The average daily attendance in the outdoor is less than 20. All these hospitals have separate water taps and conservancy arrangements. Except the hospital at Gangtok others have no electricity.

(4) In addition to the above three main hospitals with their outdoor dispensaries, owned and managed by the state, there is a Central P. W. D. Dispensary at Rongpo, which is under the Government of India and is under the charge of an Assistant Surgeon. It provides facilities for 3 emergency beds but the diet for the patients has to be arranged privately. This dispensary serves a total population of nearly 8,000 and its average daily attendance is 30 which goes up considerably during the winter season when the orange trade is in full swing there. Except the Gangtok and Namchi hospitals, where a few trained nurses are employed, the other hospitals have no trained nurse, either male or female, to look after the patients.

For medical relief, in addition to the above, the state has 6 more dispensaries *viz.*, one each at (1) Soreng Bazaar, (2) Geyzing, (3) Rhenock, (4) Dentam, (5) Phambong and (6) Mangan Bazaar. Each serves a radius of 5 to 6 miles and an average population of 8-10,000, except the one at Mangan Bazaar which serves about 2,000 people. All these dispensaries are under the charge of qualified compounders. Those at Rhenock, Dentam and Phambong are run by Missions while the rest are state institutions. It is stated that these hospitals and dispensaries together serve a population of nearly 94,000. The dispensaries are housed in private, rent-free buildings. One of the conditions laid down for opening up of a new dispensary is that the people must provide a rent free room for the same in a good locality. The rooms are mostly single or, as in Mangan Bazaar, the dispensary forms part of a joint establishment. In most cases accommodation in these dispensaries is entirely inadequate. There is no separate arrangement, whatsoever, for sitting accommodation of even emergent cases and no separate examination or operation room. Only common types of pharmacopial drugs, sulphonamides, etc., surgical dressings and equipments for minor surgery are stocked. Main diseases treated are, (1) Hookworm, (2) Tapeworm, (3) Malaria, (4) Kala-azar, (5) Dysenteries, (6) V D. and (7) Goitre but the treatment is only symptomatic. The compounder is not only his dispenser but often acts as a surgeon, a dentist and even as an obstetrician.

It is stated that the state has a plan to open one more hospital at Mangan Bazaar in the north where none exists at present and a dispensary at Kewzing in the West. Apart from these dispensaries, the state runs two mobile or travelling dispensaries, each in charge of a qualified compounder. These have no fixed area to serve but whenever reports of outbreak of Kala-azar, malaria, dysentery and diarrhœa or other illnesses are received, they move to the area concerned and administer medical relief within their limits.

Although no major epidemic of small-pox, cholera, typhus or relapsing fever has occurred during recent years the hospitals in the state has no facilities whatsoever for isolation of such cases if the necessity arises. During the survey it was revealed that small epidemics of measles, mumps and whooping cough occur from time to time particularly amongst school children and the only measure taken against these consists of isolation of the patient in their homes.

Public Health and Environmental Sanitation :

Sanitation and public health are the direct responsibilities of the C. M. O. Unfortunately for him, he has no qualified or trained personnel under him to administer these. Neither there exists any organisation for collection of vital statistics. Qualified personnel like lady doctors, sanitary inspectors, health visitors or trained dais, laboratory technicians are conspicuous by their absence. Besides the C. M. O. there are only four qualified doctors, three in the state and one in the C. P. W. D. service, *i.e.*, one qualified doctor for 27,545 persons. There are also two private unregistered medical practitioners in Gangtok. Of the doctors in state service excluding the C. M. O. only one is a graduate who has also attended the D. T. M. course in Calcutta. The Assistant Surgeon at Gangtok who is a licenciate has been trained in X-ray work ; the number of qualified nurses do not exceed more than half a dozen throughout the state. Consequently, there is no facility for any maternity or child welfare work. It was observed during our tour in the different areas that medical practice in the villages are generally in the hands of the Ojhas or witch doctors (Bong thing po) and village quacks (Nijom pow). Only when they fail, people seek relief at the hospitals, dispensaries or from qualified doctors. Labour is usually conducted at home by the husband, female relatives, neighbours or even by the lying-in woman herself. Exceptionally, a doctor or a compounder may be called for assistance but may not be available at the time.

Control of Communicable Diseases :

For the control of communicable diseases, the measures taken include (i) vaccination against such diseases as small-pox and exceptionally typhoid or cholera, (ii) home isolation, (iii) quarantine of contacts in measles, mumps, whooping cough, etc., (iv) disinfection and (v) treatment of the sick. The state maintains a separate vaccination staff who go round homes and bazaars and vaccinate. Vaccination is also performed by compounders in the dispensaries. The lymphs for such vaccination is procured from the Government of West Bengal Vaccination Laboratory or other sources. It must be said to the credit of the state that our survey revealed that both primary and revaccinations have been fairly well carried out during the past few years inspite

of the absence of vaccination laws, and no past or present case of small-pox was encountered although the possibility of its importation from Tibet is always there. For the environmental sanitation, the state employs sweepers at Gangtok, Namchi, Singtam and Rongpo. The main duties of such personnel consist of collection and disposal of night soil and street refuse and disinfection where necessity arises. For other areas, the bazaar contractors have been made responsible for looking after the sanitation of their respective places, for which they maintain one or two sweepers. In the northern areas beyond Gangtok, sweepers are not available and none is employed even for bazaar sanitation. There is no Public Health Laboratory but samples of food and water are occasionally sent to the Darjeeling Municipal Laboratory for purposes of analysis.

CHAPTER V.

Family Organisation.

Family Organisation :

The centre round which most of our public health activities revolve is the family unit. The culture, tradition and outlook of the family and the environment in which it lives, determine, to a large extent, the shaping of the individual's behaviour towards improvement of his health, culture and socio-economic conditions. In a rapid survey such as this, detailed study of the family organisation was not possible. However, we present below rough structural basis of the family organisation which may provide material foundation for the study of the spheres of activities in which the communities in Sikkim are or may be interested.

In the course of the survey, information regarding 247 family units in different zones was obtained. The total number of individuals in these families was 1,400 giving the average size of the family as 5·69 which approximates very closely the figures as revealed by the Census of 1951, *e.g.*, average number of person per census house 5·6 (rural—5·69 and urban—3·95). Most of the families had little contact with places outside the state except for a small number who took up jobs in the Indian army or police service or those who go out of the state on business, study or travel to such places as Darjeeling, Kalimpong or Calcutta. The traffic from the other direction is mostly from Tibet, Nepal and to a lesser extent from India. These floating population consists mainly of labourers from Nepal, Caravan from Tibet and traders, officials and handful of sight seers from India. Thus most of the communities are practically closed ones so far as movement of the family members are concerned. There is, however a good deal of internal movement and congregations particularly in connexion with religious fairs and festivals. Inspite of these the state has so far been spared from any serious epidemic except that of Relapsing fever in the earlier part of the century, influenza in 1918-19 and occasional outbreaks of Kala-azar and malaria, due perhaps to the absence of large scale importation of infection from outside. The five most important endemic diseases that now exist in the state and are undermining the health of the people are helminthic infections, malaria, kala-azar, venereal diseases and tuberculosis. The extent of their prevalence and the damage caused, have been discussed in details in the next Chapter.

Size and Nature of Families :

The distribution of families according to their nature and size has been given in Table XI. In this investigation a family has been defined as a unit having a common kitchen. It may be single, joint or multi. It is considered as single if it consists of husband, wife and minors ; joint, if it consists of some other closely related members in addition to the above ; and multi, when there are some members unrelated or not closely related.

Table XI.

Size and Nature of the Families.

Number of members.	Single.		Joint.		Multi.		Not Known.		Total.	
	No. of families.	No. of inmates.	No. of families.	No. of inmates.	No. of families.	No. of inmates.	No. of families.	No. of inmates.	No. of families.	No. of inmates.
1	19	19	0	0	0	0	0	0	19	19
2	25	50	0	0	0	0	0	0	25	50
3	28	84	1	3	0	0	0	0	29	87
4	23	92	1	4	0	0	0	0	24	96
5	34	170	3	15	0	0	2	10	39	195
6	18	108	1	6	1	6	0	0	20	120
7	21	147	4	28	0	0	2	14	27	189
8	16	128	2	16	0	0	2	16	20	160
9	12	108	3	27	0	0	0	0	15	135
0	7	70	0	0	0	0	0	0	7	70
11	5	55	1	11	0	0	0	0	6	66
12	3	36	1	12	0	0	0	0	4	48
13	2	26	1	13	0	0	0	0	3	39
14	2	28	1	14	0	0	0	0	3	42
16	2	32	0	0	0	0	0	0	2	32
17	1	17	1	17	0	0	0	0	2	34
18	1	18	0	0	0	0	0	0	1	18
Not known	1	..	..	..	..	..	..	..	1	..
Total	220	1,188	20	166	1	6	6	40	247	1,400

Out of 240 families for which information is available as many as 220 or 91·4 per cent were single, only 20 or 8·3 per cent were joint and 0·3 per cent were multi. In the Singur area the corresponding figures found in 1944 were 67·0, 27·0 and 5·9 per cent respectively. In other words, joint family system seems to have either been abolished or did not have any root planted in the state of Sikkim, or it may be related to the system of land tenurement. As has already been stated, the average numer of members for total families was 5·59 as against 5·4 in the case of single families, and 8·3 for the joint ones and 6 for the multi. Obviously the economic implications were greater in joint families, unless the earning members were more than one. Fortunately, the investigation revealed that a great majority of those who should have earned their wages were actually doing so. The most common family size encountered in single families was 5 and 3 was the next common. In respect of the joint families, on the other hand, this was 7 with 9 following as a close second. However, the most common size in respect of all types of families was 5. The distribution of these families according to communities given in Table XII.

TABLE XII.

Distribution of Families by Nature and Communities.

Communities.		Single.	Joint.	Multi.	Not known.	Total.	Single % of families.
Nepali	No.	108	8	0	4	120	48·7
	%	93·1	6·9	..	..	..	..
Sikkimese	No.	51	4	1	1	57	23·2
	%	91·0	7·1	1·8	..	..	..
Lepcha	No.	29	..	0	0	31	12·6
	%	93·6	26·4	..	..	..	..
Tibetan	No.	9	0	0	0	9	3·7
	%	100·0	..	..	..	..	..
Marwari	No.	10	6	0	0	16	6·5
	%	62·5	37·5	..	..	..	..
Other Indians	No.	13	0	0	0	13	5·3
	%	100·0	..	..	..	..	..
Not Known .		0	0	0	1	1	..
TOTAL .		220	20	1	6	247	100·0

Table XII shows that the percentages of families in different communities surveyed were : Nepalis 48·7, Sikkimese 23·2, Lepchas 2·6, Tibetan 3·7 and Marwari and other Indians 11·8. Among the Tibetans and 'other' Indians all were single families. Only 6 to 7 per cent of the families among the Nepalis, Lepchas and Sikkimese were joint. On the other hand, the nature of family units among the Marwaris more or less approximated to that of Singur Health Unit in the West Bengal (1944). In short, there was a great tendency for all or a great majority of the families in different communities to lead independent lives.

Family Language :

The various types of languages as spoken by the communities in Sikkim are given in Table XIII.

TABLE XIII.

Languages spoken by different communities.

Community.	Languages.							Total.
	Nepali.	Sherpa.	Sikkimese	Tibetan.	Lepchas.	Hindu.	Bengali.	
Nepali . .	118	2	..	..	..	..	..	120
Sikkimese .	1	..	42	14	..	..	..	57
Lepchas .	1	..	1	1	28	..	..	31
Tibetan .	..	..	..	9	..	..	..	9
Marwaris .	..	..	..	..	..	16	..	16
Other Indians	..	..	..	..	..	11	2	13

Table XIII shows that the Nepalis and the Tibetans were speaking strictly their community language. Sherpa language is also a type of Nepali dialect spoken by the Sherpas, Nepali tribe. The Lepchas have their own dialect but three families (about 10 per cent) amongst them were speaking not their own dialect but one of the following *viz.*, Tibetan, Sikkimese and Nepali. The Sikkimese dialect which is an offshoot of the Tibetan language was, on the other hand spoken by the majority of Sikkimese, though in 37·8 per cent of them Tibetan was still their mother tongue and only one family spoke Nepali. Among the Indian languages Hindi, though spoken by the Marwaris and other Indians is understood practically by all communities except some of the Lepchas.

TABLE XIV.

Distribution of families according to nature of family and religion.

Religion.		Nature of family.					% Single families.
		Single.	Joint.	Multl.	Not known.	Total.	
Hindu	No.	130	12	0	4	146	59·1
	%	91·5	8·5	..	..	..	
Buddhist	No.	84	7	1	1	93	37·7
	%	01·3	7·6	1·1	..	..	
Christian	No.	6	0	0	0	6	2·4
	%	100·0	..	..	..	..	
Jain	No.	0	1	0	0	1	0·4
	%	..	100·0	..	..	..	
Muslim	No.	0	0	0	1	1	0·4
	%	..	..	..	..	..	
TOTAL		220	20	1	6	247	

Of the families surveyed 59·1 per cent were Hindu, 37·7 per cent were Buddhist, 2·4 per cent were Christian, 0·4 per cent Jain and 0·4 per cent Muslim. All the Christian families and 91·5 per cent Hindu and 91·3 per cent Buddhist families were found to be single. There was only one Jain family and that was joint. Thus the Hindus and the Buddhists showed practically the same family types.

Marital Status :

The marital status of the people of the state varied according to religion. This has been shown for the different age groups in relation to the main religions of the state in Table XV.

It will be evident from this table that the percentages of married persons aged 15 years or above were highest among the Hindus, males 63·0 per cent and females 84·2 per cent. Buddhists came next in order with 58·4 per cent of their males of marriageable age and 77·0 per cent of the females being married. The precentage of married people was, however, the lowest for the Christians, only 29·4 per cent of their males of marriageable age and 25·0 per cent of their females, being married. Thus marriage was more universal among the Hindus and Buddhists compared to the Christians and other religions. As regards sexes, it was observed that proportionately more females among the Hindus and Buddhists were getting married than their males, while among the Christians the percentages of married males were slightly higher than the females. It will also be seen that amongst the Hindus both

males and females marry earlier and none remains unmarried after 45 years. Similar was not the case with the Buddhists and Christians in whom early marriages were fewer, the majority getting married after the ages of 25 years. A few males amongst them, however, married even after 45 years.

Polygamy was seen to be practised among the Nepali Hindus but not amongst other religions but polyandry was seen to be prevalent amongst the Sikkimese and Lepcha Buddhists, particularly those in the Lachen area in the north. Though widow re-marriage is common amongst the Buddhists of the State the percentage of widows amonst those above 25 years of age was higher (21·1%) than that of the Hindus (11·3%) . Both these rates are, however, lower than the rate of widowhood (30·3%) obtained in the Singur area (1944). One of the main reasons for this difference is, in our opinion, the difference in

TABLE XV.

Marital status by different religions and age groups.

Religion and sex	Marital status	0—99	10—14·9	15—19·9	20—24·9	25—44·9	45 and above	Total
Hindu Male	Unmarried	187	131	81	12	14	—	425
	Married	1	1	7	24	98	44	175
	Widower	—	—	—	—	5	4	9
Hindu Female	Unmarried	120	79	23	3	—	—	225
	Married	—	1	15	27	61	25	129
	Widow	—	—	—	—	3	8	11
Buddhist Male	Unmarried	70	76	51	13	11	2	223
	Married	—	—	4	7	60	32	103
	Widower	—	—	—	—	1	4	5
Buddhist Female	Unmarried	73	39	18	7	3	—	140
	Married	—	—	5	13	46	14	78
	Widow	—	—	—	—	2	14	15
Christian Male	Unmarried	8	13	9	1	1	1	33
	Married	—	—	—	1	3	1	5
	Widower	—	—	—	—	—	—	—
Christian Female	Unmarried	6	13	8	—	1	—	28
	Married	—	—	1	—	2	—	3
	Widow	—	—	—	—	—	—	—
Others Male	Unmarried	11	21	11	2	1	—	46
	Married	—	—	—	—	3	—	3
	Widower	—	—	—	—	—	1	1
Others Female	Unmarried	12	12	—	—	—	—	24
	Married	—	—	—	—	—	—	—
	Widow	—	—	—	—	—	—	—

the age at marriage between husband and wife which in Sikkim was found to be very small compared to that in Singur. In some cases wives in Sikkim were even older than their husbands. Taking the widows between the age of 25 and 45 years, however, the percentages of widowhood in the two religions are almost the same, Hindus 4·7 per cent and Buddhist 4·2 per cent. Among the Lepchas there is a custom that when a married elder borther dies the widow is given in marriage to one of the unmarried borthers.

Family and Economic Status :

It is well known that low economic conditions of the people predispose them to diseases, otherwise preventable, and that a great deal of the success in preventive and curative medicines depends upon the financial and other means at the disposal of the people. In any scheme for the improvement of health of the people their co-operation, both in cash as well as voluntary, is needed. As such it was of importance to know their economic conditions, as far as possible. During this rapid survey it was only possible to assess the conditions very roughly. For this purpose, the families were divided into four categories of economic strata, *viz.*, Rich, middle, poor, and very poor. The classification was based on the amount of land holdings, nature of occupation and income from sources other than land. Those with little or no earning was classed as very poor.

The distribution of families in different communities according to their economic status is given in Table XVI.

TABLE XVI.

Percentage distribution of families in different communities according to their economic status.

Economic status / Community	Total No. of families classified	Rich	Middle	Poor	Very poor
Nepali	118	13·6	25·4	35·6	25·4
Sikkimese	55	16·4	25·5	47·3	10·9
Lepcha	31	16·1	29·0	45·2	9·7
Tibetan	9	11·1	44·4	33·3	11·1
Marwari	15	80·0	13·3	6·7	0·0
Other Indians	13	0·0	61·5	30·8	7·7
ALL COMMUNITIES	241	17·8	27·8	37·3	17·0

Table XVI shows that 17·8 per cent of the families were rich, 27·8 per cent middle class, 37·3 per cent poor and 17·0 per cent very poor. The Marwaris were the richest, 80 per cent of their families falling in this category. Among the indigenous communities, nearly 59 per cent of the families were either poor or very poor, their percentages varying from 44·4 for the Tibetians to 61·0 for the Nepalis. Thus the Nepalis were the poorest, who also showed the highest sickness rate. About 27 per cent of the indigenous families belonged to the middle class and only 14·5 per cent were rich.

Family and Land Distribution :

Since the people of the state were mainly agriculturists their economic status largely depended upon the amount of land they were holding. Table XVII gives the distribution of the families according to their land holdings.

TABLE XVII.

Percentage distribution of families according to their land holdings.

Acreage of land / Community	No. of families classified	No. holding	Less than 5 acres	More than 5 but less than 10 acres	More than 10 but less than 20 acres	More than 20 acres
Nepali . . .	118	23·7	33·9	16·1	11·0	15·8
Sikkimese . . .	55	29·1	27·3	10·4	10·9	16·4
Lepcha . . .	31	19·4	32·3	19·4	12·9	16·1
Tibetan . . .	9	44·4	11·1	22·2	22·2	0·0
Marwari . . .	15	100·0	0·0	0·0	0·0	0·0
Other Indians . .	13	84·6	15·4	0·0	0·0	0.0
ALL COMMUNITIES	241	33·2	28·2	14·9	10·4	13·3

On the whole, about one-third of the families including those of the Marwaris, who were otherwise economically much better off, had no land, excluding the latter and the 'other' Indians the percentage of the families having no agricultural holdings works out to be only 25·4 per cent.

Among the indigenous communities 28·2 per cent of the families had land less than 5 acres, 15·6 per cent between 5 and 10 acres, 10·6 per cent between 10 and 20 acres and 13·6 per cent more than 20 acres.

The Tibetans had the least holdings, 44·4 per cent of their families had no land and none possessed a holding more than 20 acres.

In respect of the extent of average, the Lepchas were better placed than the Nepalese and the Sikkimese who were holding almost equal acreage.

Recreational Facilities :

Excepting a recently opened cinema house in Gangtok Bazaar there is no public recreational centre seen by us. There is, however, a club meant for higher officials at Gangtok. Some upper class families and a few officials possess personal radio sets. In places like Gangtok and Soreng Bazaar there are foot-ball grounds for school children as well as for the public. The little recreation that the villagers enjoy is from the Ram Lila performances staged during the Dusserah festivals and the religious and Devil dances during the Buddhist festivals.

Family Outlook-on Health Matters :

The majority of the people have no idea about the causation or prevention of diseases. They are mostly demonistic or deietic in outlook on general health matters inculding personal hygiene. However, they are beginning to realize the efficacy of scientific methods of treatment and prevention as evidenced by their ready acceptance of the small-pox vaccination and the spontaneous co-operation that they have given us in our survey.

Personal Hygiene :

The state of personal hygiene was found to be very poor almost amongst all communities except the Marwaris. In this respect the Tibetans and the Lepchas were dirtiest. The Sikkimese were almost equally bad. The Nepalis, on the other hand, take more frequent baths but they are otherwise no better. Most of them are extremely reluctant to change and clean their clothes, wash their hands, mouth and teeth and to clean themselves after defaecation. This state of bad personal hygiene for which the climatic conditions and difficulties of procuring water may be partly responsible, had greatly contributed to the widespread prevalence of pediculosis, worm infestation, skin diseases including scabies, dental troubles like caries, pyorrhoea, etc., found amongst them. The majority of the people also go without any footwear.

Births and Deaths :

See vital Statistics—pp. 98—102.

CHAPTER VI.

State of Health and Disease.

Medical care is rendered only to limited extent through the three existing hospitals and seven dispensaries scattered widely in the state, while qualified medical attendance is practically non-existent. The little help, if any, that the people get by way of medical relief is from those practising folk medicine, which is still widely practised in the State, particularly in the difficult and mountainous regions in the north. Not only do people often forget their ailments but they also overlook many of their minor ailments as their sensitivity to health and disease and health consciousness are of a low order. The existence of heavy helminthic infections without any complaints of sickness or ill health by those infested, is an evidence in support of that view. Usually certain amount of departure from the state of health is permitted within the broad scope of the term 'health' but the difficulty arises from the fact that different individuals or communities may make allowances of varying degrees from such deviation. It may be that the climatic conditions, particularly, at altitude higher than 5000 ft. give them a wider range of buoyancy than the people in the valleys or in the plains. The state of health and disease during the year (morbidity data) was therefore difficult to elicit. An estimate of sickness in the area was therefore made in three ways *viz.*, (*a*) by recording the history of illness during the year (past one year), (*b*) by undertaking physical examination of individuals supported by laboratory confirmation as far as possible, and (*c*) by studying the hospital and dispensary records.

For reasons stated above the results obtained by the first method would be rather an under-estimate of the incidence of sickness while the hospital and dispensary records did not give an idea about the actual incidence among the population. This deficiency was, however, overcome by the second method which gave us the better picture of the prevalence of different types of sickness in the area than that obtained from the hospital and dispensary figures. Thus, the morbidity data are presented here under the following three headings : *viz.*, (i) sickness at the time of survey, (ii) sickness during the previous 12 months and (iii) the annual returns from hospitals and dispensaries.

For the purpose of this investigation sickness has been classified into three categories, *viz.*, acute, chronic and indifferent ; acute or chronic illness refer to those who are obviously ill with acute or chronic symptoms with more or less curtailment of normal physiological functions and activities while those who are not obviously sick but presented certain symptoms or evidence of low physical capacity as revealed by physical examination have been placed under the category of 'indifferent health.'

(a) Sickness at the time of Survey :

At the time of survey 252 persons out of 1673 examined or 15 per cent were found to be either sick or in indifferent health. Of these, 1·5 per cent were actually ill, 4·4 per cent were chronically ill and the remaining 9·1 per

cent in indifferent health (see table XVIII). The corresponding figures as obtained in the Singur area (West Bengal) in 1944 were 1·1, 2·2 and 8·4 per cent respectively. The sickness rate in the Sikkim State, as cobserved during the survey, was thus higher than that of Singur. Even so, it is actually an under-estimate because of such linical conditions as tonsils and adenoids, caries, goitre and helminthic infestations which though widely prevalent did not produce any apparent loss of physiological function or capacity and hence have been excluded from the above sickness rates.

The percentage distribution of the total sick at the time of survey in different zones in the order of their relative incidences, as given in table XVIII, were 28·7 per cent in the southern, 19·6 per cent in the eastern, 6·6 per cent

TABLE XVIII.

State of health and sickness at the time of survey by zones.

Zones	Well		Acutely ill		Chronically ill		Indifferent		Total Sick		Percentage acute and chronic	Per cent of indifferent in total sick
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	Sickness in the population surveyed	
Central (522) . . .	483	92·5	5	0·96	6	1·11	28	5·3	39	7·5	2·07	71·8
Southern (345) . . .	246	71·35	11	3·18	42	12·17	46	13·3	99	28·65	15·35	46·5
Western (522) . . .	461	88·31	6	1·11	11	2·1	44	8·43	61	11·68	3·21	72·1
Eastern (194) . . .	156	80·4	2	1·03	12	6·18	24	12·37	38	19·6	17·21	63·1
Northern (90) . . .	75	83·30	1	1·1	3	3·3	11	12·2	15	16·6	4·4	73·3
All zones (1673) . .	421	85·0	25	1·5	74	4·4	153	9·1	252	15·0	5·9	60·7

in the northern, 11·7 per cent in the western and 7·5 per cent in the central zones. Thus the central zone was the healthiest and the southern the most unhealthy, the western, northern and eastern being in the intermediate position. In respect of acute and chronic sicknesses only, the incidences were as follows : 15·35 per cent in the southern zone, 7·21 in the eastern zone, 4·40 in the northern zone, 3·21 in the western zone and 2·07 in the central zone, as against 5·90 per cent in the entire state (all zones combined). The distribution of these in 'indifferent' health was in the same order as those for the acute and chronic sicknesses, and it will be seen later that this condition was mainly due to the prevalence of various types of helminthic infestations throughout the State. Of the total sickness at the time of survey 60·7 per cent were due to indifferent health. The proportions of persons in indifferent health to the total sickness were 73·3, 72·1, 71·8, 63·1 and 46·5 per cent in the northern, western, central, eastern and southern zones, respectively. Thus in the northern and western zones nearly ¾th. of the total sick were those who were in indifferent health compared to the southern which had not only the highest total incidence of sicknesses but also more acute and chronic types of diseases.

The principal diseases detected during survey in indifferent zones have been tabulated in Table XIX. The order of their prevalence was as follows : Hookworm, skin diseases, including scabies and warts, malaria, Kala-azar tuberculosis, tapeworm, venereal diseases, roundworm, 'other' fevers, epilepsy and other nervous diseases, throat infections and tropical ulcers. The total sickness rate as calculated from Table XIX was 18·6 per cent as against 15 per cent shown in table XVIII. This was due to several individuals suffering from more than one disease at a time . It may be pointed out here that the helminthic diseases listed in the table relate only to those who showed suspicious symptoms with laboratory confirmations wherever possible. There was however, a much larger group of persons who were infested but did not present any clinical evidence of the disease. These cases will be referred to again.

As stated earlier, there was considerable variation from zone to zone not only in the distribution of the total sickness but also in the prevalence of individual diseases. Thus, in the southern zone which had the highest sickness rate, the principal diseases encountered, in order of their relative prevalence, were malaria, hookworm, kala-azar and tropical ulcers ; in the eastern zone these were hookworm, skin diseases, epilepsy and nervous disorders, followed by malaria, kala-azar and venereal diseases ; in the northern zone, helminthic diseases specially tapeworm and hookworm infections, and venereal diseases were mainly encountered ; in the western zone hookworm, tuberculosis, skin diseases and venereal diseases were the principal diseases seen ; in the central zone, on the other hand, which had the lowest sickness rate, the main diseases were skin diseases, tapeworm, venereal diseases, tuberculosis, hookworm and throat infections. .

Taking the principal causes of sickness separately, helminthic disorders like hookworm, tapeworm and roundworm infestations, scabies, warts and other skin diseases, and venereal diseases were encountered in every zone,

Table XIX.

Distribution of sickness at the time of survey by principal causes in different zones.

Principal Causes	Zones											
	Central		Southern		Western		Eastern		Northern		All Zones	
	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000
	1	2	3	4	5	6	7	8	9	10	11	12
Ankylostomiasis (Hookworm) . .	3	57	20	580	30	575	17	876	3	333	73	436
Ascariasis (Round worm) . .	2	38	2	58	3	57	2	103	1	111	10	60
Colds and cough	2	38	..	—	—	..	1	52	—	—	3	18
Diabetes	..	—	..	—	2	38	1	52	..	..	3	18
Diarrhoea and dysentery . .	..	—	..	..	2	38	1	52	..	..	3	18
Ear Disease (Otitis media) . .	1	19	1	29	2	38	—	—	—	—	4	24
Epilepsy and other nervous diseases .	3	57	1	29	2	38	3	155	—	—	9	54
Eye diseases	2	38	2	58	—	—	1	52	1	111	6	36
Fevers, others	2	38	4	116	2	38	1	52	1	111	10	60
Heart disease	—	—	—	—	—	—	1	52	—	—	1	6

Influenza	—	—	—	—	—	—	—		1	111	1	6
Ill-defined cause		—	—	—	4	77	2	103	—	—	6	36
Kala-azar		—	20	580	2	38	2	103	—	—	24	143
Malaria	—	—	24	696	—	—	2	103	1	111	27	161
Mental Disorder	—	—	—	—	2	38	—	—	—	—	2	12
Pneumonia, Pleurisy and Bronchitis and other respiratory diseases.	2	38	3	87	3	57	—	—	—	—	8	48
Rheumatic	2	38	—	—	—	—	—	—	—	—	2	12
Rickets	2	38	—	—	1	19	—	—	—	—	3	18
Skin diseases *including* warts	14	268	2	58	6	115	8	412	—	—	30	179
Tapeworm	7	134	1	29	2	38	1	52	6	667	17	102
Throat infection (Acute)	3	57	1	29	2	38	1	52	—	—	7	42
Tropical Ulcer	—	—	7	203	—	—	—	—	—	—	7	42
Tuberculosis, Pulmonary	3	57	2	29	6	115	—	—	—	—	11	66
Tuberculosis, Gland	—	—	—	—	8	153	—	—	—	—	8	48
Typhoid	1	19	—	—	—	—	—	—	—	—	1	6
Venereal disease	4	77	—	—	5	96	2	103	5	556	16	96
Whooping cough	1	19	—	—	—	—	—	—	—	—	1	6
Miscellaneous	7	134	4	116	6	115	1	52	1	111	19	114
TOTAL	61	1,169	94	2,725	90	1,724	47	2,423	20	2,222	312	1,865

Table XX.

Incidence of other clinical states detected among well persons.

Clinical State	Central		Southern		Western		Eastern		Northern		Total	
	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000
Adenoids and Tonsils . . .	40	766	7	203	26	498	9	464	1	111	83	496
Caries and other dental disorders .	47	900	3	88	40	766	12	619	7	778	109	771
Cretin	2	38	—	—	1	19	—	—	—	—	3	18
Goitre	30	575	29	841	37	709	27	1,392	1	111	124	741
Pediculosis	16	307	—	—	5	96	1	52	3	333	25	149
All the states combined . . .	135	2,586	39	1,130	109	2,088	49	2,526	12	1,333	344	2,056

while malaria, kala-azar, tuberculosis and tropical ulcers were more or less zonal problems, *e.g.*, malaria and kala-azar in southern and eastern zones, tuberculosis in the western and central and tropical ulcer in the southern zone, particularly in the Singtam area. Other epidemic diseases like typhoid, whooping cough, influenza, mumps, measles, chicken-pox, diarrhoea and dysentery though not observed at the time of survey also occurred.

As stated before, in addition to the principal causes of sickness referred to above, certain other conditions, which though present did not give rise to subjective symptoms nor interfered with the normal life of the people so as to be classified in any of the three categories of sickness as defined at the outset. In order of prevalence these were goitre, caries and other dental disorders, tonsils and adenoids, and pediculosis (see Table XX). Their total incidence was as high as 20·5 per cent in the sample population. Of these, goitre was widely prevalent, the highest incidence being obtained for the eastern zone and the lowest for the northern. Caries was present in all zones but its prevalence was lowest in the southern zone. Adenoids and tonsils showed the highest prevalence in the central regions but was not seen in the northern zone, which had the highest incidence of pediculosis. No case of pediculosis was, however, seen in the southern zone. Cases of cretinism were also encountered in three instances.

(b) Sickness during the year (past one year):

In the sample population of 1,673 as many as 526 persons or 31·5 per cent gave history of being sick at one time or the other in the course of the 12 months preceding the date of investigation. The main causes of such sickness as revealed by the survey have been presented in Table XXI. It would be seen that malaria headed the list of all past sicknesses with an incidence rate of 944 per 10,000, inspite of its incidence being confined mostly to the southern and partly to the eastern zones. 'Other' fevers came second in order of importance with a rate of 508 per 10,000. This might also include some cases of malaria and kala-azar. Next in order of prevalence was whooping cough with a rate of 191 per cent per ten thousand, followed by pneumonia and other lung diseases (167) and kala-azar (167). The latter, like malaria was mostly observed in the southern zone. Other diseases in order of importance were diarrhoea and dysentery, mumps, influenza, tapeworm, venereal diseases, eye diseases (like cataract, trachoma and conjunctivities, etc.), typhoid fever, chicken-pox, digestive disorder, tropical ulcer, tuberculosis, scabies, tonsilitis, adenoids and rheumatic conditions. The miscellaneous group consisted of 3 cases of liver disorders, 3 cases of colds and cough, 2 non-venereal genitourinary cases, one case of anthrax and one case of black-water fever.

Only a few persons could give definite history of having suffered from hookworm during the past 12 months, although the present investigation showed that it was widespread throughout the state. This might be due to lack of proper diagnosis. The same could be true of other worm infections and perhaps of tuberculosis and conditions included under ill-defined causes. Thus, for reasons stated above and mentioned earlier, it appears that the incidence rate, as revealed by the history of sickness during the year, is an underestimate.

TABLE XXI.

Zonal distribution of principal sickness in the Sikkim State during the year 1953.

Diseases	Central		Southern		Western		Eastern		Northern		All Zones	
	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000
Adenoids and Tonsils . . .	3	57	—	..	—	..	1	52	—	..	4	24
Chicken-pox	3	57	—	..	3	57	—	..	—	..	6	36
Diarrhoea and Dysentery . .	10	192	2	58	6	115	5	258	—	..	23	137
Disorders of digestive system, other .	1	19	—	..	5	96	—	..	—	..	6	36
Eye diseases	4	77	—	..	2	38	—	..	1	111	7	42
Fevers, other	23	441	16	464	36	690	9	464	1	111	85	508
Hookworm	1	19	—	..	1	19	—	..	—	..	2	12
Ill-defined causes	4	77	1	29	18	345	3	155	—	..	26	155

Influenza	3	57	—	..	6	115	1	52	—	..	10	60
Kala-azar	—	..	24	696	4	77	—	..	—	..	28	167
Malaria	8	153	131	3,797	4	77	11	567	4	444	158	944
Measles	3	57	—	..	18	345	1	52	—	..	22	132
Mumps	9	172	11	319	—	..	—	..	—	..	20	120
Pneumonia, Pleurisy and other lung diseases.	18	345	2	58	6	115	1	52	1	111	28	167
Rheumatic conditions	2	38	—	..	—	..	1	52	—	..	3	18
Round worm	—	..	—	..	3	57	—	..	—	..	3	18
Skin disease (scabies, pediculosis)	—	..	—	..	5	96	—	..	—	..	5	30
Tape worm	4	77	—	..	1	19	—	..	3	333	8	48
Tropical ulcer	—	..	5	145	—	..	—	..	—	..	5	30
Tuberculosis, lung	—	..	—	..	1	19	—	..	—	..	1	6
Tuberculosis, of other organs	1	19	—	..	1	19	1	52	—	..	3	18
Typhoid	2	38	—	..	3	57	1	52	—	..	6	36
Venereal disease	1	19	—	..	1	19	4	206	1	111	7	42
Whooping cough	31	594	—	..	1	19	—	..	—	..	32	191
Miscellaneous	10	192	3	87	12	230	3	155	—	..	28	167
TOTAL	141	2,701	195	5,652	137	2,625	42	2,165	11	1,221	526	3,151

The analysis of sickness by zones again showed that its total incidence was higher, 56·5 per cent, in the southern zone which was mostly due to malaria and partly to 'other' fevers, kala-azar, mumps and tropical ulcer, in order of prevalence. Next to come in order were the central and the western zones where the prevalence rates of sicknesses at the time of survey were the lowest. The causes of sickness which occurred during the year in the central zone in order of their importance were whooping cough, other fevers, pneumonia and other lung diseases, diarrhoea and dysentery, mumps, malaria, tapeworm, eye diseases, tonsils and adenoids and venereal diseases. This high incidence of sickness in this zone was due to an epidemic of whooping cough and mumps which alone contributed to about 7·7 per cent of the total rate of 27·0 per cent found in this zone. Besides, a higher educational and cultural levels of the people in Gangtok helped them to give correct histories.

The causes of illness in the western zone, in order of prevalence, were, 'other' fevers, measles, ill-defined causes, pneumonia and other lung diseases influenza, diarrhoea and dysentery, skin diseases, malaria, kala-azar, chickenpox, roundworms and venereal diseases, the total incidence rate being 26·2 per cent. The eastern zone, on the other hand, with an incidence rate of 21·6 per cent was slightly better off than the western, the principal causes of illness here during the year, in order of their importance, were malaria, 'other' fevers, diarrhoea and dysentery and venereal diseases. The lowest incidence of sickness during the year, 12·2 per cent was, however, recorded in the northern zone, the chief causes of such illness being malaria and tapeworm.

As stated earlier, at the time of survey 15 per cent of the population was sick and another 31·5 per cent had suffered from one disease or the other during the year. The population of the Sikkim state as obtained from the census record of 1951, is 137,725. Thus according the above rates it is estimated that at any particular moment there would be at least 2,066 persons acutely ill, 6,060 persons chronically ill and 12,533 indifferent health or 20,659 persons would be unwell. The total number of persons who have suffered, from one or the other disease during the year would be 43,383, but this figure, as already mentioned, is rather an under-estimate. The organisation of medical care and public health services would depend upon the magnitude of the problems as revealed by the above figures.

(c) Hospital and dispensary statistics :

As has already been pointed out, the annual returns of hospitals and dispensaries do not reflect the actual distribution or the prevalence of sickness among the population. Moreover, old and new admissions have not been shown separately in these returns and as such the figures are always inflated, because it cannot be ascertained with certainly how many times each case or each type of case attended. Nevertheless, they are not without value for, when analysed they give us a rough idea about the relative proportions of different types of sickness amongst those attending the hospitals and dispensaries for treatment. These figures when compared with those obtained by the survey would enable one to have a more comprehensive picture about the incidence of different types of sicknesses in the state. A table incorporating the returns of different hospitals and dispensaries for the year 1952, as obtained through the courtesy of the Civil Surgeon of the State, is given in Appendix V.

Table XXII is presented here to show roughly the proportional distribution of principal causes of sickness in the state, as (i) revealed by the survey, and (ii) among those seeking medical relief in the different hospitals and dispensaries. For reasons already stated it would not be strictly justifiable to make any comparative study except on the assumption that the number of times of persons attended the hospital or the dispensary did not vary much in respect of individual sickness.

Taken each cause separately, it will be seen that the proportions of cases of anæmia, eye diseases, rheumatic conditions, diarrhoea and dysentery and worm infestations among those attending the hospitals and dispensaries fairly corresponded to their respective proportions noted in the community during the survey. On the other hand, the proportions of cases of fevers, kala-azar, malaria, typhoid, tuberculosis, venereal diseases, skin diseases, throat infections and other infectious diseases, etc., fell far short of their relative distributions in the community. However, the relative proportions of attendances in respect of disease like goitre (see Table XX), epilepsy and nervous disorders, pneumonia and other lung diseases, accidents, digestive disorders, ulcers including tropical ulcer, were higher than those obtained by the survey. It may also be mentioned here that such conditions as tonsils and adenoids, caries and pediculosis (see Table XX) were not taken serious note of by the people to see medical relief although their incidence, according to the survey was not inconsiderable.

TABLE XXII.

Proportional distribution of causes of sickness excluding goitre in the community and in the hospital returns of Sikkim State.

Diseases	Number per 100 cases at the time of survey	Number per 100 cases during the year	Number per 100 cases attending hospital and dispensaries
Accident	..	..	4·89
Anæmia (severe)	1·92	.	1·42
Diabetes	0·96	..	0·02
Diarrhoea and Dysentery	0·96	4·37	4·71
Digestive disorders, other	..	1·14	10·17
Diseases of nose	..	..	..
Ear diseases	1·28	..	.69
Epilepsy and other nervous dis.	2·88	..	3·27
Eye diseases	1·92	1·35	1·63
Fevers (other)	3·21	16·16	2·05

TABLE XXII—*contd.*

—	Number per 100 cases at the time of survey	Number per 100 cases during the year	Number per 100 cases attending hospital and dispensaries
Genito-urinary non-V.D.	1·28	..	.72
Heart disease	0·32	..	·10
Ill defined causes	1·92	4·94	.50
Kala-azar	7·69	5·32	2·69
Liver disease	..	..	·46
Malaria	8·65	30·04	15.22
Mental diseases	0·64	..	0·02
Other infectious diseases	0·64	13·68	2·97
Pneumonia, Pleurisy & Bronchitis	2·56	5·32	9·77
Rheumatic condition	0·64	0·57	0·73
Rickets	0·96	..	·02
Skin disease	9·62	0·95	2·88
Small-pox	..	..	.006
Throat infection	2·24	0·76	..
Tropical ulcer	2·24	0·95	7·57
Tuberculosis	6·09	0·76	·38
Typhoid	0·32	1·14	·056
Venereal disease	5·13	1·33	·59
Worms	32.2	2·47	24·38
Miscellaneous	2·88	5·32	1·76

This difference in the relative proportions of the figure of sickness among those attending medical institutions for relief and those examined during the survey might be due to some of the following causes, namely, acuteness of illness, distance from the hospital or dispensary centre, difficulties of communication, lack of proper facilities for diagnosis, individual differences due to low sensitivity to health, educational and cultural backwardness, the people's customs and habits and their inclination to stick to the available folk medicine and the extreme dearth of qualified medical personnel, private or official. However, inspite of these deficiencies the picture of community sickness as obtained from the hospital returns closely resembled those obtained by the survey.

The analysis of hospital returns, however, does not enable one to know what percentage of cases from the sick persons in the community do avail of the facilities for medical care, provided for, in the state. This would have been possible if the exact number of new admission were known. It is, however, well known that the quality of medical care depends greatly upon the number, type and qualifications of the personnel employed.

PRINCIPAL DISEASES.

Malaria :

As has already been shown in Tables XIX and XXI and in Appendix V that malaria though not uniformly prevalent throughout the state still tops the list amongst the principal causes of sickness. The percentage of the people sick with this disease at the time of survey was 1·61 and another 9·44 per cent gave history of having suffered from it one time or the other during the past twelve months. This is also reflected in the hospital and dispensary admissions, in which the highest attendance, next to worm infestations, was due to malaria. On a conservative estimate 15,000 people in the whole state suffer from malaria every year. The most severely affected area is the southern zone where at least 30 per cent of all sicknesses was due to this disease alone. Although no case of malaria was encountered in the central and western zones at the time of survey, history of sickness during the year revealed that few cases had also occurred there. Hospitals and dispensaries in the state, however, returned malaria cases from almost all zones according to which the southern was the most malarious, followed by the western, eastern, central and northern. The cases in the central zone, particularly in the Gangtok area, was mostly imported, as people from all areas came there for business, study or treatment in the hospitals.

Spleen rate :

All spleens which were palpable and could be measured in terms of finger's breadth were recorded as enlarged. For the purpose of the present report details of the size of the spleen has been omitted from analysis and the spleen rate has been calculated on the basis of enlarged spleen defined above.

Zone, Altitude and Splenic Enlargement :

The distribution of spleen rates according to zone and altitude is given in Table XXIII.

As will be seen from Table XXIII, the spleen rates at the time of survey in the central, southern, western, eastern and northern zones were 0·63, 47·3, 0·83, 7·8 and 5·0 per cent, respectively, the combined rate of all zones being 9·8 per cent. Thus the most affected zone was the southern which may be called highly endemic (spleen rate—47·3 per cent) while the eastern and northern zones came next in order with the spleen rates of 7·8 and 5·0 per cent, respectively.

TABLE XXIII.

Distribution of enlarged spleens in Sikkim according to zone and altitude.

Zone.	ALTITUDE.																	
	—1000 ft.		—1500 ft.		—2000 ft.		—3000 ft.		—4000 ft.		—5000 ft.		—6000 ft.		+6000 ft.		All Altitudes.	
	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.	No. exmd.	No. enlarged.
Central	..	..	..	..	..	..	..	..	318	2 0·63%	..	..	119	1* 6·84%	39	0	476	3 0·63%
Southern	57	41 71·93%	71	40 56.3%	36	11 30·5%	28	10 35.7%	27	2 7·4%	1	0	..	..	..	..	220	104 47·3%
Western	..	..	..	..	..	..	7	0	8	0	286	3 1·05%	59	0	1	0	361	3 0·83%
Eastern	6	5 83·3%	..	..	..	..	63	2 3·2%	..	..	96	6 6·2%	2	0	..	..	167	13 7·8%
Northern	..	..	..	..	3	..	8	3 37·5%	9	0	..	..	14	0	26	0	60	3 5·0%
All zones Percentage . .	63	46 73·0	71	40 56·3	39	11 28·2	106	15 14.2	362	4 1·1	383	9 2·35	194	1 0·52	66	0 0·0	1,284	126 9·8

Distribution of spleen rates by altitude :

The spleen rate which was 73·0 per cent upto an altitude of 1000 ft. progressively declined as the altitude increased and came down to 1·1 per cent at the level of 4000 ft. Thereafter it bacame almost negligible. Thus from the point of malarial endemicity altitudes upto 3000 ft. were malarious. Of these, altitudes upto 1000 ft. was hyper endemic, those upto 2000 ft. moderately endemic and those between 2000-3000 ft. lowly endemic. Regions above 3000 ft. were almost free zones. Whatever enlarged spleen could be seen here was mostly in adults and was due to infection contracted lower down.

Age and spleen rates :

The Table XXIV gives the distribution of malaria as evidenced by the enlarged spleen, by age groups and zone. It shows that, on the whole, malaria prevalence was nearly hyperendemic in the southern zone, the splenic rate in children below 15 years being 50 per cent. Even in the higher age groups in this regions the rate was considerably high. Most probably this was due to the simultaneous prevalence of kala-azar in the villages in which malaria was highly endemic. In the eastern and in the northern zones, on the other hand, malaria was found to be much less prevalent compared to the southern zone. The central and the western zones were almost free and the few enlarged spleens that were seen these were mostly in persons who gave history of contracting the infection somewhere outside his zone.

TABLE XXIV.

Distribution of splenic enlargement in Sikkim by zones and principal age groups.

Zones.	AGE.											
	—15 years.			15—25 years.			25 years & above			TOTAL.		
	No. examd.	No. enlarged.	% enlarged.	No. examd.	No. enlarged.	% enlarged.	No. examd.	No. enlarged.	% enlarged.	No. examd.	No. enlarged.	% enlarged.
Central . .	289	0	0·0	111	2	1·8	76	1	1·32	476	3	0·63
Southern .	104	52	50·0	29	13	44·8	87	39	44·8	220	104	47·3
Western	225	0	0·0	03	0	0·0	73	3	4·1	361	3	0·83
Eastern	66	1	1·5	36	2	5·6	65	10	15·4	167	13	7·8
Northern	21	2	9·5	14	1	7·1	25	0	0·0	60	3	5·0
All Zones	705	55	7·8	253	18	7·1	326	53	16·3	1284	126	9·8

The distribution of spleen rates according to nationality and sex is given in Table XXV.

TABLE XXV.

Distribution of spleen rates in Sikkim according to nationality and sex.

Nationality.	MALE.			FEMALE.			BOTH SEXES.		
	No. examd.	No. enlarged.	% enlarged.	No. examd.	No. enlarged.	% enlarged	No. examd.	No. enlarged.	% enlarged.
Nepali . . .	433	68	15·7	243	24	9·9	676	92	13·6
Sikkimese . .	133	1	0·75	89	3	3·4	222	4	1·8
Lepcha . . .	87	2	2·3	48	0	0·0	135	2	1·5
Tibetian . . .	58	1	1·7	24	0	0·0	82	1	1.2
Marwari . . .	57	14	24.6	20	6	30·0	77	20	26·0
Other Indians . .	44	7	15·9	19	0	0·0	63	7	11.1
Not known . .	19	0	0·0	10	0	0·0	29	0	0·0
TOTAL .	831	93	11·2	453	33	7·3	1,284	126	9·8

The distribution of spleen rates according to nationality showed that among the indigenous communities in Sikkim, Nepalese had the highest rate, 13·6 per cent, whereas the Tibetans, the Lepchas and the Sikkimese had all very low rates which did not exceed 1·2 per cent. This may be largely explained by the fact that these three communities do not usually live at lower altitudes where malaria is prevalent. On the other hand, the spleen rate among the Marwaries was even higher than that among the Nepalese, namely, 26·0 per cent. The rate was also higher among the males of 'other' Indians. The spleen rates among the females of the Marwaries and Sikkimese were relatively higher compared to their males. No splenic enlargement was however, found among the females of the 'other' Indians, the Tibetans and the Lepchas.

Blood Parasites :

No blood parasite other than malarial was found in any person. Thick and thin blood films of 1233 persons were examined. Only 28 persons showed the presence of the parasite at the time of the survey (2·3 per cent). The distribution of the parasite rate in children below 15 years and adults in various zones and altitudes is given in Table XXVI.

TABLE XXVI

Incidence of malarial parasite in the children below 15 years and adults according to zone and altitude.

Zones.	Age groups years.	ALTITUDE								Total. examd.	No. positive.	Percentage positive.	GRAND TOTAL.	
		—1500 ft.		—3000 ft.		—5000 ft.		5000 ft. & above.						
		No. examd.	No. positive.	No. examd.	No. positive.	No. examd.	No. positive.	No. examd.	No. positive.				No. examd.	No. positive.
Central . .	—15	..	..	..	..	225	0	48	0	273	0	0·0		0
	+15	..	..	..	..	90	0	84	0	174	0	0·0	447	(0·0)
Southern .	—15	59	11	33	3	16	0	..	..	108	14	13·0		26
	+15	56	10	67	2	7	0	..	..	130	12	9·2	238	(10·9)
Western .	—15	..	..	1	0	165	0	51	0	217	0	0·0		1
	+15	..	..	2	0	116	1	5	0	123	1	0·8	340	(0·3)
Eastern .	—15	..	..	20	0	46	0	2	0	68	0	0·0		1
	+15	..	..	44	0	51	1	0	0	95	1	1·05	163	(0·6)
Northern .	—15	0	0	2	0	5	0	8	0	15	0	0·0		0
	+15	1	0	2	0	4	0	23	0	30	0	0·0	45	(0·0)
Total . .	—15	59	11	56	3	457	0	109	0	681	14	2·05		
	+15	57	10	115	2	268	2	112	0	552	14	2·53		
All zones .	All ages	116	21	171	5	725	2	221	0	1,233	28	2·3		
			(18·1)		(2·7)		(0·28)		(0·0)					

As expected, the parasite rate was highest in the southern zone where out of 108 children examined the blood of 14 or 13·0 per cent showed the presence of malaria parasites. Among the adults in this zone the rate was 9·2 per cent. In the eastern and western sectors the rates amongst children was *nil* while amongst adults these were 0·6 and 0·3 per cent respectively. In the other two zones no malaria parasite was detected amongst the 492 blood smears from person of all ages examined.

There was a clear variation in parasite rate of all ages with regard to the altitude. As altitudes increased rates diminished. Thus the rates were 13·1, 2·92, 0·28 corresponding to the altitudes of —1,500 ft., —3,000 ft. and —5000 ft. No parasite was detected at altitudes above 5000 ft. This relationship between the parasite rate and variation of altitude corresponded to that stated earlier between the spleen rate and the altitude.

Prevalent types of malaria parasites and their percentages :

The distribution of different species of malarial parasites detected is given in Table XXVII.

TABLE XXVII.

Species of malaria parasite and their percentages.

Type.	Asexual.	Sexual.	Both.	Total.	Per cent.
B. T.	3	0	8	11	39·3
M. T.	4	5	7	16	57·1
Q. T.	0	0	1	1	3·6
All types .	7	5	16	28	100·0

Of the 28 parasites detected 11 or 39·3 per cent were due to *P. vivax.*, 16 or 57·1 per cent were due to *P. falciparum*, while in only one instance or 3·6 per cent, *P. Malariæ* was detected. Thus, in Sikkim all the three important types of human malaria parasites were found to be present but the most predominant type was *P. falciparum* at the time of survey.

As many as 21 out of 28 parasite-positive individuals, were harbouring gametocytes giving a gametocyte rate of 1·7 per cent in the population investigated. All cases who showed malaria parasite in the blood had also enlarged spleens, except in two cases who had recent attacks of fever.

Distribution of Malaria :

The incidence of spleen and parasite rates in relation to the number of clinical cases of malaria in the different zones is given in Table XXVIII.

TABLE XXVIII.

The incidence of malaria as determined by clinical cases, spleen and parasite rates in different zones.

Zone.	No. of persons examined.	MALARIA CASES — At the time of survey.	RATE PER 10,000 — During the year.	Spleen rate in children.	Adult spleen rate.	Total spleen rate.	Parasite rate in children —15 yrs.	Adult parasite rate.	Total parasite rate.
Central	522	0	153	0·0	1·6	0·63	0·0	0·0	0·0
Southern	345	395	3,797	50·0	44·8	47·3	13·0	9·2	10·9
Western	522	0	77	0·0	2·2	0·83	0·0	0·8	0·3
Eastern	194	103	567	1·5	11·9	7·8	0·0	1·05	0·6
Northern	90	111	444	9·5	2·6	5·0	0·0	0·0	0·0
TOTAL	1,673	161	944	7·8	12·26	9·8	2·05	2·53	2·3

It will be seen that at the time of the survey no case of malaria or any malaria parasite was detected in the surveyed area of the central zone. In the southern zone where endemicity was found to be the highest a spleen rate of 50 per cent and a parasite rate of 13·0 per cent were obtained ; 7 per cent of the population in this zone was sick with malaria at the time of survey and nearly 38 per cent gave of history of having had it within the past 12 months (*see* Tables XIX and XXI). In the western zone which was found non-endemic, the parasite rate was 0·3 per cent and no clinical malaria was detected at the time of survey though 0·77 per cent of the population gave history of having had the disease during the year. In the eastern zone where the rates for both spleen (1·5 per cent) and parasite (0·6 per cent) were relatively higher than those in the western zone, the incidence of clinical malaria was about 1 per cent during the survey and 5·7 per cent during the past 12 months. The northern zone, on the other hand, had a higher spleen rate 9·5 per cent than any other zone except the southern. Here 1·6 per cent of clinical cases were seen at the time of the survey and another 4·4 per cent suffered during the year.

Mosquito Fauna :

For want of time and pressure of other work no systematic mosquito catching could be made from every zone we visited. These were mainly collected in the Singtam-Rangpo area of the southern zone. The types found were mostly *A.minimus* and a few adults of *A.vagus* and *A.subpictus*. *A. minimus* was encountered upto an altitude of 3000 ft. of this zone. It was found breeding rather heavily in the back water of the rivers Teesta and Rangpo, minor streams, nullahs and irrigation channels. Although no dissection could be done to look for the parasite in this mosquito, known to be an efficient vector in the neighbouring terrai regions of the Darjeeling district, its presence in such a high proportions amongst our catches, leaves no doubt as to its role in the transmission of malaria in this area. Regarding other mosquitoes *culicines* were encountered in almost all zones and in altitudes as high as 5000 ft. or little above, as in Gangtok in the central zone and Chungthan in the north.

Search was also made in a few instances for Sandflies in the southern zone where many cases of kala-azar were seen, but none was encountered. There is a popular belief in Sikkim that kala-azar appeared there following the importation of a wild shrub called 'Assam lata' which grows luxuriantly in the valleys. On investigation no scientific basis could be obtained to support this belief, although search was extensively made in one highly endemic village Majitor, in the southern zone.

Referring to the Tables XIX and XXI and Appendix V, it would be evident that Kala-azar was highly prevalent in the southern and, to a lesser extent, in the eastern and western zones. The zonal distribution along with the results of aldehyde test is given in table XXIX.

TABLE XXIX.

Distribution of Kala-azar cases in Sikkim according to zones and Aldehyde test.

Zone.	Sample Population.	KALA-AZAR CASES.				ALDEHYDE TEST.		
		At the time of survey.		During the year.				
		No.	Rate per 10,000.	No.	Rate per 10,000.	No. tested.	No. positive.	No. doubtful.
Central	522	0	0·0	0	0·0	1	0	1
Southern	345	20	580	24	696	24	17	1
Western	522	2	38	4	77	8	3	1
Eastern	194	2	103	0	0·0	2	2	0
Northern	90	0	0·0	0	0·0	0	0	0
All zones	1,673	24	143	28	167	35	22	3

In the southern zone 5·8 per cent of the population at the time of survey and another about 7 per cent during the past 12 months were sick with this disease. The corresponding figures were 0·38 and 0·77 per cent for the western and 1·03 and 0·0 per cent for the eastern zone. The hospital returns of 1952 also showed that nearly 2·7 per cent of all attendances in the state were due to Kala-azar, but it was mainly in the southern and western zones. During the present survey, nearly 1 per cent of the population of the eastern zone was found to be suffering from Kala-azar. The sickness rate of Kala-azar during the year was about 0·67 per cent. Thus, even on a conservative estimate about 2,300 persons suffered from Kala-azar in the Sikkim state during the year under survey and the highest endemicity was obtained in the southern zone.

Of the total 35 samples of blood for which the results of aldehyde test were available 22 or 64·8 per cent were highly positive and three gave doubtful results. No suspected case of Kala-azar was however seen among the persons examined in the northern zone. Of the 24 samples examined from the southern zone as many as 17 or 70·8 per cent were found positive. In the western zone 3 samples out of 8 or 37·5 per cent were found positive. In the eastern zone 2 samples were examined and both gave positive result. Only one sample was examined from the central zone and it gave doubtful reaction. It may be mentioned here that only blood sample of those suspected to be suffering from Kala-azar were examined for aldehyde test.

The distribution of the confirmed Kala-azar cases among the different age groups of the population is given in Table XXX.

Table XXX.

Distribution of confirmed Kala-azar cases in Sikkim according to age groups.

Age group.	Population.	Number of cases.	Per cent.
0—14·9	884	6	0·68
15—24·9	343	5	1·46
25—34·9	175	3	1·71
35—44·9	143	5	3·50
45 and above	155	5	3·23
Total	1,700	24	1·41

It will be seen from Table XXX that the incidence of Kala-azar increases with age, attaining the maximum rate at about 35 years. Thus, the disease was more prevalent among the adult population and was minimum in children below 15 years.

Altitude and Kala-azar :

The distribution of Kala-azar according to altitude was as follows : —1,000 ft. 6 cases, —1,500 ft. 9 cases, —3,000 ft. 5 cases, —5,000 ft. 4 cases, 5,000 ft. and above no case. Thus like malaria, Kala-azar cases were also not found at or above the altitude of 5.000 ft.

Tuberculosis :

People in Sikkim are not so much conscious about tuberculosis. Although at the time of survey 11 cases of lung and 8 cases of non-pulmonary tuberculosis, giving a rate of about 144 per 10,000 population , were detected, only 4 persons (2·4 per 10,000) of which 1 only was of the pulmonary type, gave history of tuberculosis during the year (see tables XIX and XXI). Nevertheless, the hospital returns for 1952 (Appendix V) showed that a total of 54 cases of tuberculosis, including 23 non-pulmonary types, were admitted indoor for treatment and the total number of outdoor attendances, both new and old, was 211 including 65 non-pulmonary types. The overall tuberculosis rate according to the survey thus comes to about 138 per 10,000. Calculated on this basis about 1,900 persons would be suffering from tuberculosis in the whole state. One interesting feature of tuberculosis in the state was the discovery of a high proportion (nearly half the cases) of non-pulmonary tuberculosis, contrary to the findings in the Indian plains. This throws considerable doubt on the local cattle population, a large majority of which were found to be of foreign breed.

Tuberculosis infection :

The tuberculosis infection rate as determined by tuberculin test is shown in Table XXXI.

TABLE XXXI.

Results of Tuberculin test by zones and age groups.

Age group (years).	CENTRAL.			SOUTHERN.			WESTERN.			EASTERN.			NORTHERN.			ALL ZONES.		
	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.
0—14·9	226	66	29·2	33	9	27·3	96	11	11·5	41	4	9·8	Not done			396	90	22·3
15 years and above.	125	50	40·0	16	4	25·0	51	19	37·2	50	15	30·0	Not done			150	88	36·4
TOTAL.	351	116	33·0	49	13	26·5	147	30	20·4	91	19	20·9	Not done			638	178	27·9

No tuberculin test could be done for the northern zone as the time allotted for the places visited in that zone, was too short for the reading of the results. The overall tuberculin positive rates were 33·0, 26·5, 20·9 and 20·4 per cent in the central, southern, eastern and western zones, respectively. The infection rate was thus highest in the central zone and this was true for both children and adults, as will be seen from the Table XXXI. The rates obtained for the central zone in the different age groups are more or less similar to those generally observed in the semi-urban areas of India, whereas the rates observed in other zones particularly the eastern and the western, more or less correspond to those of the rural areas of India. The rate of tuberculosis infection in Sikkim as obtained during the survey are lower than the figures obtained by Ukil for Kalimpong in 1937 where he found a total infection rate of 44·5 per cent ranging from 38·6 per cent in children below 15 years to 55·3 per cent in adults. The infection rate of 27·2 per cent as seen among those below 15 years in the southern zone lies also intermediate between the rural and the urban figures for India. The infection rate generally increased with the increase of age in both sexes except for a slight drop among those above 15 years in the southern zone. This might be due to the small number of persons tested there. The results of tuberculin reaction between the two sexes is given in Table XXXII.

TABLE XXXII.

Results of Tuberculin test by age and sex.

Age groups.	MALE.			FEMALE.			BOTH SEXES.		
	No. tested.	No. Positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.
0—4·9 . . .	8	0	0·0	10	0	0·0	18	0	0·0
5—9·9 . . .	89	17	19·1	59	16	27·1	148	33	22·3
10—14·9 . . .	149	35	23·5	81	22	27·2	230	57	24·8
15—44·9 . . .	157	56	35·6	51	19	37·2	208	75	36·0
45 and above . .	26	13	50·0	8	0	0·0	34	13	38·2
TOTAL .	429	121	28·2	209	57	27·3	638	178	27·9

The results as given in Table XXXII show that no children, male or female, below 5 years, gave positive tuberculin reaction. The infection seemed to be contracted after that age and thereafter in both the sexes it showed as expected a progressive rise, with the rise in age. The highest rate of infection 38·2 per cent, was obtained in the males of the age group above 45 years. Regarding the sex, females in all age group except those above 45 years, showed higher infection rates than those in the males, but the overall infection rate in them was slightly lower, 27·3 per cent as against 28·2 per cent in males.

Intensities of Tuberculin Reaction in different age groups :

The intensities of raction among the positive tuberculin reactors in different age groups is shown in Table XXXIII.

TABLE XXXIII.

Intensities of tuberculin reaction in different age groups.

Age groups (years).	Intensities of Reaction.								Total positive reactors.
	+		++		+++		Vesiculation.		
	No.	%	No.	%	No.	%	No.	%	
0—14·9 . .	46	51·1	30	33·3	13	14·4	1	1·1	90
15—44·9 . .	46	61·3	19	25·3	10	13·3	0	0·0	75
45 and above .	10	76·7	3	23·3	0	0·0	0	0·0	13
All age groups	102	57·3	52	29·2	23	12·9	1	0·56	178

Table XXXIII shows that more than half of the reactors (57·5 per cent) gave one plus reaction, 29·2 per cent two plus, 12·9 per cent three plus reaction and only one (0·56 per cent) showed vesiculation, whereas the percentage of one plus reactors increased with age, the majority of those showing higher degrees of reaction were mainly children below 15 years in whom 33·3 per cent gave two plus, 14·4 per cent one plus and 1·1 per cent vesiculation reaction.

Community, sex and tuberculin reaction :

Table XXXIV give the distribution of tuberculin reaction by community and sex.

TABLE XXXIV.

Distribution of tuberculin reaction according to community and sex.

Community.	Male.			Female.			Both Sexes.		
	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.	No. tested.	No. positive.	% positive.
Nepali . . .	211	58	27·5	114	31	27·2	325	89	27·4
Sikkimese . .	54	18	33·3	28	7	25·0	82	25	30·5
Lepcha . . .	43	14	32·6	25	7	28·0	68	21	30·9
Tibetan . . .	48	18	37·5	16	5	31·3	64	23	35·9
Marwari . . .	31	5	16·1	9	4	44·4	40	9	22·5
Other Indians . .	27	6	22·2	12	2	16·7	39	8	20·5
Not known . .	15	2	13·3	5	1	20·0	20	3	15·0
TOTAL .	429	121	28·2	209	57	27·3	638	178	27·9

The highest infection rate (38·9 per cent) obtained was amongst the Tibetans, followed by the Lepchas (30·9 per cent) and the Sikkimese (30·5 per cent) and then by the Nepalis (27·4 per cent), Marwaris (22·5 per cent) and ' other ' Indians (20·5 per cent) in order. The last two communities showed the lowest infection rates. Females in all communities except the Marwaris showed a lower rate than the males. The Marwari females, on the other hand, showed the highest rate, *e.g.*, 44·4 per cent taking both sexes and all communities together.

Venereal Diseases.

The incidence of clinical syphilis and gonorrhoea as detected at the time of survey and reported to have occurred during the past 12 months, has been summarised in Table XXXV along with the records of hospital admissions during the year 1952.

Table XXXV.

Distribution of Venereal Diseases according to zone.

	6—Zones.											
	Central.		Southern.		Western.		Eastern.		Northern.		Total.	
	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000	No.	Rate per 10,000
V. D. cases at the time of the survey.	4	77	0	0	5	96	2	103	5	556	16	96
V. D. cases during the past 12 months.	1	19	0	0	1	19	4	206	1	111	7	42
Hospital and dispensary admission	89	—	66	—	82	—	13	—	75	—	325	—

Table XXXV shows that both syphilis and gonorrhoea are prevalent in the state. According to the survey data 31 persons or 0·96 per cent of the population were suffering from this disease at the time of examination and another 7 or 0·42 per cent suffered during the past 12 months. In the hospital returns also, attendance for these causes was more or less recorded in all dispensaries and constituted about 0·6 per cent of the total attendances (*see* table XIX and XXI and Appendix V). If the incidence is roughly taken as 1 per cent, the total number of persons suffering in the whole state should be 1370.

No case of syphilis or gonorrhoea was, however, detected in the southern zone nor any of the persons examined here gave history of having suffered from the disease during the past 12 months. But there were records of 66 attendances in the Singtam and Rangpo hospitals. Excepting this zone, cases were, however, seen in all other zones, the highest rate being obtained in the northern, followed by the eastern, the western and the central zones in order of prevalence.

Wassermann Reaction :

Altogether 47 samples of blood out of a larger number collected, could be examined for Wassermann reaction. The results are given in Table XXXVI.

TABLE XXXVI.

Results of Wassermann Reaction by zones

Zones.	Number of samples examined.	Negative.	Results anticomplementary.	Positive.	Percentage positive.
Central	9	4	3	2	22·2
Southern	7	4	3	0	0·0
Western	15	11	2	2*	13·3
Eastern	3	3	0	0	0·0
Northern	13	9	2	2	15·4
TOTAL	47	31	10	6	12·8

* 1 Sample Kahn positive.

The few samples collected from the southern and the eastern zones were found positive or anticomplementary. The rates of positive samples in the central, western and northern zones were found to be 22·2,13·3 and 15·4 per cent respectively, the overall positive rate of the suspected samples being 12·8 per cent. Their distribution according to the various nationalities is given in Table XXXVII.

TABLE XXXVII.

Results of Wassermann reaction to communities.

(**F**-*Female*)

Community.	No. of Samples tested.	Number negative.	No. anticomplementary.	Number positive.	Percentage positive.
Nepali	15 (1F)	10(1F)	3	2	13·3
Sikkimese	11(1F)	4(1F)	3	4	36·4
Lepcha	11(1F)	9	2(1F)	0	0·0
Tibetan	1	1	0	0	0·0
Marwari	6(1F)	5(1F)	1	0	0·0
Other Indians (Biharis)	3	2	1	0	0·0
TOTAL	47	31	10	6	12·8

The above gives us but rough picture of the prevalence of venereal diseases in the state. Although its incidence may not be considered high compared to diseases like worm infestation, malaria, Kala-azar, tuberculosis or goitre, the condition may deteriorate further if steps are not taken early to prevent their spread in view of the growth of towns like Gangtok from where blood samples showed larger number of positives than those from other places.

It will also be seen that only the Nepalis and Sikkimese showed evidence of syphilitic infection in their blood. The rate of positive samples in the Sikkimese was more than twice as high (36·4 per cent) as that (13·3 per cent) in the Nepalis. No sample of blood from any other community was found positive for syphilis while no females of any community was found positive for syphilis.

Stool Parasites.

Of the 1700 individuals examined in the survey, specimens of stool from 275 persons or 16·2 per cent were examined for helminthic ova and other intestinal parasites. Their distribution by zones was central 56, southern 32, western 102, eastern 51 and northern 34. By communities these were Nepali 121, Sikkimese 74, Lepcha 32, Tibetan 14, Marwari 22 and other Indians 12. The infestation rates of different species of helminths according to zones are given in Table XXXVIII and according to community in Table XL.

Table XXXVIII.

Distribution of stool parasites by zones.

Zones.	Percentage of population infested with			
	Hookworm.	Roundworm.	Tapeworm.	Trichuris.
Central	51·8	28·6	8·9	51·8
Southern	53·1	34·4	0·0	21·9
Western	50·0	33·3	11·8	20·6
Eastern	25·5	39·2	27·5	0·0
Northern	2·9	26·5	64·7	0·0
All zones	40·4	32·7	19·3	20·7

As will be seen from table XXXVIII helminthic infestation was wide, spread and heavy. The principal types of parasites seen were hookworm, round-worm, tapeworm and trichuris. Oxyuris was comparatively infrequent, being found in only 4 cases—3 in the western zone and 1 in the northern. Of the total infestations the majority (40·4 per cent) was due to hookworm. All zones were heavily infested except the northern where tapeworm was predominant. In the southern, central and western sectors 50 per cent or more of the samples examined showed the presence of hookworm ova. In the eastern zone its incidence was much less, as only 25 per cent of the samples were positive. It was least prevalent in the northern zone where roughly 3 per cent of the sample were positive.

Next in order of importance was roundworm which formed 32·7 per cent of the total positive stools. Unlike hookworm, this parasite was observed to be much widely prevalent, no zone showing a percentage less than 20·5 per cent it was highest (39·2 per cent) in the eastern zone and the lowest 26·5 per cent in the northern. In regard to tapeworm, however, the highest rate, 64·7 per cent, was observed in the northern zone and no infestation in the southern, while the rates in the eastern, western and central zones were 27·5, 11·8 and 8·9 respectively. This tapeworm infestation rate was directly related to the food habits of the people, the northerners using pork and beef more extensively than the people of the other zones. In the southern regions which is inhabited mostly by the Nepali Hindus, who do not consume pork and beef, no tapeworm infestation was found among the surveyed people. Trichuris infestation was peculiarly confined to the first three zones namely, central, southern and western but generally it is not of any serious pathological significance.

Table XL.

Distribution of stool parasites by communities.

Community.	Percentage of population infested with			
	Hookworm.	Roundworm.	Tapeworm.	Trichuris.
Nepali	62·8	44·6	0·83	24·0
Sikkimese	21·6	27·0	43·2	13·5
Lepcha	31·3	28·1	40·6	15·6
Tibetan	21·4	14·3	50·0	35·7
Marwari	22·7	13·6	0·0	22·7
'Other' Indians	8·3	16·7	0·0	25·0
All zones	40·4	32·7	19·3	20·7

The distribution of helminthic infestation by communities is given in Table XL. It shows that the Nepali community suffer mostly from hookworm (62·8 per cent) and roundworm (44·6 per cent), tapeworm being altogether absent, because of the reason already stated. There was, however, only single case of tapeworms amongst this community and that was in a Nepali Buddhist who ate pork and beef (see Appendix VI). Tapeworm infestation was otherwise confined to the three communities namely Sikkimese, Lepcha and Tibetan, the infestation rates being 43·2, 40·6 and 50 per cent respectively. No tapeworm infestation was found among the Marwaris or 'other' Indians. As has already been stated this infestation was strictly related to the food habits of the communities concerned. Hookworm and roundworm infestation rates among the Sikkimese were 21·6 and 27·0 per cent respectively. The corresponding rates among the Lepchas, the Tibetans, the Marwaris and other Indians were 31·3 and 28·1, 21·4 and 14·3 per cent for hookworm and 22·7 and 13·6 and 8·3 and 16·7 per cent for roundworm. Thus the 'other' Indians with 8·3 per cent rate had the least hookworm infestation. Trichuris infestation was heaviest, 35·7 per cent, among the Tibetans, its distribution in other communities ranged between 13·5 to 25 per cent.

From the Tables XXIX a, b, c, & d, given in Appendix VI, it will be seen how the different communities have behaved in different zones in respect of these helminthic infestations. Thus from both laboratory and clinical examinations it appeared that intestinal helminthiasis caused the highest amount of sickness and incapacitation among the local population. This finding also received support from the returns of the hospitals and dispensaries. A large number of cases complaining of digestive disorders, abdominal pain, anaemia and other vague symptoms which could not be accurately diagnosed, were most probably cases of helminthic infestations. This problem of worm disease should therefore receive high priority in public health campaign against community sickness.

It may also be pointed out here that the above findings are based on rough field method of stool examination. Investigation invloving the use of more exact method would have revealed still higher rate of infestation. In actual practice the condition is undoubtedly more serious than has been depicted

here. This widespread worm infestation almost throughout the state is due to the bad personal hygiene, dietetic habits, already mentioned, and to the universal practice of indiscriminate defaecation resulting in widespread pollution of soil which is favourable, on physiographical reasons, for the development, survival and transmission of intestinal helminthic parasites.

Goitre.

Goitre is another important endemic disease of the state. Although it does not generally incapacitate a person quickly it undoubtedly undermines his health as the thyroid gland is the chief of the endocrine system, governing the metabolic and other physiological functions of the body. It results in ugliness and deformities and often gives rise to serious complications. Along with this condition a few cretins were also seen. The number of attendances in the hospitals and dispensaries from this cause, as noted in the annual return for 1952 (see Appendix V), indicated that this condition was fairly widespread throughout the state except that it was much less prevalent in the northern sector where the number of hospital attendances and the clinically recognized cases during survey were comparatively fewer. This will be evident from the Table XLI.

Table XLI.

Zonal distribution of goitre as obtained from the hospital admissions and from actual survey.

	Zones.					
	Central	Southern.	Western.	Eastern.	Northern.	Total.
Hospital figures (1952)	380	2,616	2,583	535	40	6·155 (10% of Total hospital admissions).
Survey data . .	30	29	37	27	1	124
Per cent . .	5·5	8·4	7·1	13·6	1·1	7·4

The overall incidence rate of goitre as obtained during the survey was 7·4 per cent. As a single cause of a clinical condition affecting health as distinct from sickness it showed the highest incidence compared to the principal causes (see Table XIV) but it varied from 1·1 per cent in the northern to 13·6 per cent in the eastern zone, the rates in the southern, western and central zones being 8·4, 7·1 and 5·5 per cent respectively. In the returns from the hospitals and dispensaries, however, it constituted a little more than 10 per cent of the total admissions and was third in order, among the principal causes of sickness for which people sought medical relief. The age and sex distributions of the cases seen during the survey are given in Table XLII.

TABLE XLII.

Percentage distribution of Goitre in different zones by Age and Sex.

Age groups (years).	ZONES.																			
	MALES.							FEMALES.							BOTH SEXES.						
	Central	Southern	Western	Eastern	Northern	Total	Per cent	Central	Southern	Western	Eastern	Northern	Total	Per cent	Central	Southern	Western	Eastern	Northern	Total	Per cent
0—4·9 . . .	0·0	5·6	0·0	0·0	0·0	1	1·8	0·0	0·0	0·0	11·1	0·0	1	1·3	0·0	2·6	0·0	6·7	0·0	2	1·5
5—14·9 . . .	1·9	5·6	11·9	16·2	0·0	35	7·6	15·2	11·4	7·5	32·3	0·0	40	14·0	8·0	7·8	10·7	23·5	0·0	75	10·0
15—24·9 . . .	1·1	10·0	3·0	7·7	0·0	8	3·6	25·0	11·4	9·4	15·4	0·0	13	10·8	4·1	10·8	5·1	10·3	0·0	21	6·1
25 and above . .	3·4	9·1	3·7	0·0	0·0	12	4·1	0·0	9·8	4·3	20·7	7·1	14	7·7	2·0	9·4	3·9	7·9	2·4	26	5·5
All ages . . .	1·9	7·7	7·7	6·9	0·0	56	5·4	10·6	9·3	5·9	23·2	2·6	68	10·2	5·5	8·4	7·1	13·6	1·1	124	7·3

Table XLII shows that goitre was proportionately more prevalent among the females than among males in all the zones except the western ; the total female rate was nearly twice (10·6 per cent) as high as that in the males (5·4 per cent). In the eastern zone this was even higher (23·2 per cent). While no case of goitre could be detected in any infant, only two cases were seen among 136 children in the age group 1-5 years, giving a rate of 1·5 per cent. The highest rate (10·0 per cent) was seen amongst children of the age group 5-15 years, the age at which the condition becomes clinically detectable.

The distribution of goitre by altitude is given in Table XLIII.

TABLE XLIII.

Percentage distribution of goitre according to altitude.

Altitude.	—1,000 ft.	—2,000 ft.	—3,000 ft.	—4,000 ft.	—5,000 ft.	—6,000 ft.	above 6,000 ft.	Total.
Number of cases.	11	11	19	6	37	39	..	124
Per cent .	8·9	8·9	16·3	4·8	29·8	31·5		
					61·3			

Though goitre was found to be prevalent upto an elevation of 6000 ft. the majority of cases of 61·3 per cent, however, was found in altitude between 5,000 and 6,000 ft. No case was seen above 6,000 ft. In the northern sector, however, cases were mostly limited upto Mangan Bazaar, at an elevation of about 3,700 ft. The problem of goitre in the state needs more detailed investigation.

TROPICAL ULCER.

Ulcers of the skin are quite common as will be seen from the hospital return given (Appendix V). As high as 6·8 per cent of total admissions in the hospitals, etc. were due to this condition. As it was not differentiated into various types by causes it is difficult to say how many of these were due to the specific conditions like the tropical ulcer. Among the various cases of ulcers seen by us in the southern zone 7 cases showed on smear examination the presence of *fusiform bacillus* along with *Treponema vincenti* and were thus confirmed as cases of tropical ulcer. These formed 2 per cent of the total sickness in the area. This condition was not seen in any other zone.

HAEMOGLOBIN.

One thousand one hundred and forty persons were examined for haemoglobin content of blood. Their distribution according to communities and sex is given in Table XLIV. It may be mentioned here that the present analysis gives only the overall picture and includes the haemoglobin content of blood of sick persons who constitute about 15 per cent of the population examined.

TABLE XLIV.

Distribution of Haemoglobin values according to Sex and Community.

Nationality.		MALE.					FEMALE.					BOTH SEXES.				
		—50%	—75%	—90%	+90%	Total.	—50%	—75%	—90%	+90%	Total.	—50%	—75%	—90%	+90%	Total.
Nepali	No.	5	260	128	6	399	5	137	80	3	225	10	397	208	9	624
	%	1·25	65·2	32·1	1·5		2·2	60·9	35·6	1·3		1·6	63·6	33·3	1·4	
Sikkimese	No.	0	36	62	12	110	2	18	38	3	61	2	54	100	15	171
	%	0·0	32·7	56·4	10·9		3·3	29·5	62·3	4·9		1·2	31·6	58·5	8·8	
Lepcha	No.	0	37	39	6	82	0	15	20	3	38	0	52	59	9	120
	%	0·0	45·1	47·6	7·3		0·0	39·5	52·6	7·9		0·0	43·3	49·2	7·5	
Tibetan	No.	0	28	25	2	55	0	8	11	0	19	0	30	36	2	74
	%	0·0	50·9	45·5	3·6		0·0	42·1	51·9	0·0		0·0	48·7	48·7	2·7	
Marwari	No.	4	33	15	2	54	1	11	3	0	15	5	44	18	2	69
	%	7·6	62·3	28·3	3·8		6·7	73·3	20·0	0·0		7·25	63·8	26·1	2·9	
Other Indians	No.	2	26	15	0	43	0	7	10	0	17	2	33	25	0	60
	%	4·8	61·9	35·7	0·0		0·0	41·2	58·8	0·0		3·3	55·0	41·7	0·0	
Not known	No.	0	11	6	0	17	0	2	3	0	5	0	13	9	0	22
	%	0·0	64·7	35·3	0·0		0·0	40·0	60·0	0·0		0·0	59·1	40·9	0·0	
TOTAL	No.	11	431	290	28	760	8	198	165	9	380	19	629	455	37	1,140
	%	1·46	56·7	38·2	3·7		2·1	52·1	43·4	2·4		1·7	55·1	40·0	3·2	

The overall haemoglobin deficiency was high ; 56·8 per cent of the population examined showed a value less than 75 per cent and 1·7 per cent less than —50 per cent haemoglobin. Unlike the Singur area, females showed higher values than the males except in those who had less than 80 per cent haemoglobin. The overall deficiency was however much greater in the Singur area in 1944, 82·9 per cent of the males and 87·8 per cent of the females there showing less than —75 per cent haemoglobin. Among the communities, the Sikkimese showed relatively higher values than others. The 67·3 per cent of those examined had haemoglobin values higher than 78 per cent while in 8·8 per cent these values even exceeded 90 per cent. The Lepchas and Tibetans came next in order, 56·7 per cent of the Lepchas and 51·4 per cent of the Tibetans examined had haemoglobin values above 75 per cent. The other communities that came in order in this category were the other Indians (41·7 per cent) and the Marwaris (29·0 per cent). The latter had the poorest haemoglobin values. This was mainly due to 80 per cent of their females having a value lower than 75 per cent as against 70 per cent of the Marwari males.

This low haemoglobin values amongst the Nepalis and the Marwaris were probably due to malaria and hookworm infestations. The Sikkimese, Lepchas and Tibetans, on the contrary, though subjected to worm infestations did not show very low haemoglobin values presumably because they had rather more tapeworm, than hookworm or malarial infections. Perhaps their dietetic habits as well as altitude and climatic conditions under which they lived also helped them to maintain higher values for haemoglobin.

Effect of zone and altitude on Haemoglobin :

The incidence of various grades of haemoglobin deficiencies according to zone and altitude is shown in Table XLV.

TABLE XLV.

Distribution of haemoglobin values according to zone and altitude.

Altitude.	Haemoglobin Content.								Total.
	—30%		—75%		—90%		90% †		
	No.	%	No.	%	No.	%	No.	%	
—1,500 ft.	8	6·9	94	80·5	14	12·6	0	0·0	116
—3,000 ft.	8	6·5	80	64·5	36	29·0	0	0·0	124
—5,000 ft.	3	0·42	366	51·2	320	45·6	19	2·7	714
5,000 ft. & above	0	0·0	89	45·6	79	42·4	18	9·7	186
Zone									
Central	0	0·0	194	47·7	200	49·1	13	3·2	407
Southern	18	9·6	143	76·5	26	13·9	0	0·0	187
Western	0	0·0	180	52·6	148	43·3	14	4·1	342
Eastern	1	0·66	96	63·1	54	35·5	1	0·66	152
Northern	0	0·0	16	30·8	27	51·9	9	17·3	52

It will be seen from Table XLV that there is a distinct relationship between the haemoglobin values and altitude. The percentage of people showing deficiency of haemoglobin at 50 per cent level decreased from 6·9 to 0·0 as the altitude increased from —1,500 ft. to 5,000 ft. and above. The same phenomenon was observed with regard to values —75 per cent, the percentage of people showing this level of haemoglobin decreased from 80 5 per cent at —1,500 ft., 45·6 per cent at 5,000 ft. and above. On the other hand, the reverse is the phenomenon with values —90 per cent and above 90 per cent. In other words, the haemoglobin content improved with the increase of altitude. For instance, upto 3,000 ft. none of the individuals examined showed haemoglobin level higher than 90 per cent.

Similar effect is also seen when the data is analysed on zonal basis. For instance, there is a definite shift of the haemoglobin value towards the left in the southern zone where 9·6 per cent of individual showed a haemoglobin value less than —50 per cent and none had any value above 90 per cent level. There is a similar shift in the eastern zone, though much less marked than the southern. On the other hand, the northern zone showed a definite shift to the right with 17·3 per cent individuals showing haemoglobin values higher than 90 per cent level. Similar shift, though less marked, was also noted in the western and the central zones. The zones arranged in order of high values of haemoglobin are as follows : northern, western, central, eastern and southern. Thus, both altitude and zones have certain amount of influence on the haemoglobin values of the population. On physiological grounds also influence of altitude is expected. Thus, the southern zone gave the lowest haemoglobin values. This is what was expected because of the high prevalence of malaria, kala-azar, and hookworm in this area.

Nutritional Status.

A quick and rough estimate of the nutritional status of the people was made through rapid clinical examinations. The general nutritional status of different communities and sexes is given in Table XLVI.

Table XLVI.

Distribution of nutritional status in different sexes and communities.

Nationality.	Male.					Female.					Both Sexes.				
	Good.	Fair.	Marked anaemia.	Moderate anaemia.	Population examd.	Good.	Fair.	Marked anaemia.	Moderate anaemia.	Population examd.	Good.	Fair.	Marked anaemia.	Moderate anaemia.	Population examd.
Nepali	174	137	28	82	421	45	73	22	38	178	219	210	50	120	599
	41·3	32·5	6·65	19·5		25·3	41·0	12·3	21·3		36·5	35·0	8·3	20·0	
Sikkimese	98	27	1	12	138	56	23	3	8	90	154	50	4	20	228
	71·0	10·5	0·72	8·7		62·2	25·8	3·3	8·8		67·5	21·9	1·75	8·8	
Lepcha	64	17	3	14	96	19	16	1	4	40	83	33	4	18	136
	66·7	17·7	3·1	14·6		47·5	40·0	2·5	10·0		61·0	24·2	2·94	13·2	
Tibetan	45	4	0	2	48	11	6	1	1	19	56	10	1	3	67
	93·7	8·3	0·0	4·2		57·9	31·6	5·3	5·3		83·6	14·9	1·5	4·5	
Marwari	34	15	4	15	68	3	12	1	5	21	37	27	5	20	89
	50·0	22·0	5·9	22·0		14·3	57·1	4·8	23·8		41·5	30·3	5·6	22·4	
Other Indian	29	8	4	5	44	5	5	0	1	11	34	13	4	6	55
	65·9	18·2	9·1	11·3		45·4	45·4	0·0	9·1		61·8	23·6	7·9	10·9	
Not known	9	5	0	5	19	5	4	0	1	10	14	9	0	6	29
	47·3	26·3	0·0	26·3		50·0	40·0	0·0	10·0		48·3	31·0	0·0	20·7	
Total	453	213	40	135	834*	144	139	28	58	369	597	352	68	193	1203
	54·3	25·5	4·8	16·2		39·0	37·6	7·6	15·7		49·6	29·3	5·65	16·05	

* A few had more than 1 clinical conditions.

Twelve hundred and three persons comprising 834 males and 359 females of different communities were clinically examined for their nutritional status. Nearly half (48·7 per cent) of the persons examined were found to be in good physical and nutritional condition, in 29·3 per cent it was fair and 16 per cent was moderately anaemia while another 6 per cent was severely anaemia. In regard to the communities the Tibetans showed the best nutrition, 83·6 per cent of them being in good nutritional state. The Nepalese showed the poorest nutrition, only 36·5 per cent of them were found to be in good nutritional state. The Sikkimese, other Indians, the Lepchas and the Marwaris all came intermediate though some cases of severe anaemia were also seen among the Marwaris and other Indians. With regard to the prevalence of moderate anaemia (haemoglobin values between 65-75 per cent) the Marwaris came first with a rate of 22·4 per cent followed closely by the Nepalis (20·7 per cent), the rates for other communities being 13·2 per cent for the Lepcha, 10·9 per cent for other Indians, 8·8 per cent for the Sikkimese and 4·5 for the Tibetans. Between the sexes, the females were, on the whole, definitely worse off in regard to physical and nutritional state than the males. The difference was particularly marked among the Marwaris, Tibetans, other Indians and the Lepchas. No case of severe anaemia was detected among the females of other Indians. How much of this anaemia was due to iron deficiency is difficult to say but there is no doubt that a great deal of it might have been due to the widespread prevalence of hookworm and other parasitic diseases.

Extent of general malnutrition:

Malnutrition due to vitamin deficiencies was rare except that due to riboflavin. The percentage distribtuion of this deficiency in different communities is shown in Table XLVII. The highest rate, 6·0 per cent, of riboflavin deficiency was noted amongst the Tibetans. The rates in other communities were as follows. Sikkimese 3·94 per cent, Lepcha 2·94 per cent, Napalis 1·5 per cent and Marwaris 1·1 per cent. No deficiency was, however, found among the 55 ' other ' Indians other than Marwaris. Considering maize being the staple cereal of the people, particularly those in higher altitudes, a high percentage of riboflavin deficiency was natural but this has perhaps been somewhat counter-balanced by the inclusion of meat in their diet.

TABLE XLVII.

Percentage distribution of Riboflavin and other Vitamin deficiencies in different communities.

Deficiencies.	Communities.													
	Nepali (599).		Sikkimese (228).		Lepcha (136).		Tibetan (67).		Marwari (89).		Other Indians (55).	Not known (20).	Total (1205).	
	No. positive.	% positive.	No. positive.	% positive.	No. positive.	% positive.	No. positive.	% positive.	No. positive.	% positive.	No. positive.	No. positive.	No. positive.	% positive.
Vitamin A .	1	0·17	0	0·0	0	0·0	0	0·0	0	0·0	0	—	1	0·08
Vitamin B_1 .	1	0·17	0	0·0	0	0·0	0	0·0	1	1·1	0	—	2	0·17
Vitamin B_2 (Riboflavin).	9	1·5	9	3·94	4	2·94	4	6·0	1	1·1	0	—	27	2·24
Vitamin C .	0	0·0	1	0·43	0	0·0	0	0·0	0	0·0	0	—	1	0·08
Vitamin D .	1	0·17	0	0·0	0	0·0	0	0·0	0	0·0	0	—	1	0·08

Dietetic Habits :

In view of the foregoing observations on the nutritional state of the people it would be interesting to know the quality and character of the diet consumed by different communities. Although it was not possible to make any regula diet survey information in this point was collected by the questionnaire method. The results are given in Table XLVIII.

Table XLVIII.

Types of Diet consumed by individuals of different communities.

Communities.	Vegetarian.		Non-Vegetarian.														Total individuals classified.
			Beef.		Pork.		Mutton.		Buffalo.		Poultry.		Other Meat.		Total.		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Nepali	122	23·0	14	2·6	114	21·5	402	75·7	41	7·7	317	59·7	105	19·8	409	77·0	531
Sikkimese . . .	8	3·7	130	59·8	163	75·0	189	86·9	72	33·1	170	78·2	63	29·0	209	96·3	217
Lepcha	0	0·0	88	71·5	103	83·7	114	92·7	40	32·5	112	91·1	43	35·0	123	100·0	123
Tibetan	6	17·1	23	65·7	15	42·8	19	54·3	4	11·4	13	37·1	11	31·4	29	82·9	35
Marwaris	85	100·0	0	0·0	0	0·0	0	0·0	0	0·0	0	0·0	0	0·0	0	0·0	85
Other Indians . . .	21	50·0	2	9·5	1	4·8	21	100·0	0	0·0	16	76·2	0	0·0	21	50·0	42
Total .	242	23·4	257	24·9	396	38·3	745	72·1	157	15·2	628	60·8	222	21·5	791	76·6	1033

It will be seen from Table XLVIII that 23·4 per cent of the sample population were vegetarian and 77·6 per cent non-vegetarian. Among the non-vegetarians 24·9 per cent used beef, 38·3 per cent pork, 72·1 per cent mutton, 15·2 per cent buffalo meat, 60·8 per cent poultry and 21·5 per cent from other sources in addition. Among the communities the Marwaris were strictly vegetarians, the Lepchas strictly non-vegetarians while the other Indians were equally divided between the two groups. Only 3·7 per cent of the Sikkimese, 17·1 per cent of the Tibetans and 23·0 per cent of the Nepalis were also not consuming meat. Beef was equally popular among the Tibetans, Lepchas and the Sikkimese, but 2·6 per cent of the Nepalese who were Buddhists and 9·5 per cent of the other Indians who were Muslims were also consuming it. Pork was consumed mostly by the Lepchas and the Sikkimese and less so by the Tibetans and still less by the Nepalese and the least by the other Indians. Mutton and poultry were rather more popular but somewhat less used by the Tibetans. Buffalo meat was occasionally consumed mostly by the Lepchas and the Sikkimese.

Consumption of Milk and Tea :

Information on this important items of food and drinks was available for 1,007 individuals. The number of people using it and the manner in which it was being consumed is shown in Table XLIX.

TABLE XLIX.

Extent of Milk and Tea consumption in different communities.

Communities.	No. of persons examined.	Person Consuming.						Per cent of people consuming tea.
		Milk only.		Milk with tea.		Both.		
		No.	%	No.	%	No.	%	
Nepali	528	205	38·8	323	61·2	37	7·0	68·2
Sikkimese	214	37	17·3	177	88·7	14	6·5	89·2
Lepcha	101	35	34·6	66	65·4	14	13·9	79·3
Tibetan	34	6	17·6	28	82·4	3	8·8	91·2
Marwari	79	78	98·7	1	1·3	41	57·7	59·0
Other Indians	43	18	41·9	25	58·1	4	9·3	87·4
Not known	8	1	12·0	7	87·1	0	0·0	—
TOTAL	1007	380	37·7	627	62·3	113	11·2	73·5

From the Table XLIX it will be seen that the habit of drinking milk is not so popular with the people of the state, in general. Only 37·7 per cent consuming milk as it is. Excluding the Marwaris and 'other' Indians this

figure comes down to 32·3 per cent. In other words, only 1 person out of every 3 consumed milk. Since children below 15 years constituted 52 per cent of the sample population surveyed, it may safely be assumed that a large number of children was going without it and adults perhaps took very little, if any. In regard to the communities, less than 18 per cent of the Sikkimese and Tibetans were using milk as against 34·6 per cent of the Lepchas and 38·8 per cent of the Nepalese, while there was hardly any person among the Marwaris who was not consuming it.

In contrast with this, tea was a much more popular drink than milk and the proportions of these consuming this beverage in different communities were practically in reverse order to those of milk. Perhaps climatic condition was partly responsible for this preference.

State of Immunisation against Smallpox :

It was found convenient to enquire familywise about the state of vaccination against smallpox. The local term for vaccination is ' khope '. Altogether 247 families comprising 1460 individuals in different zones were examined for the purpose. One striking feature noted was that inspite of the general backwardness of the people regarding the conception of communicability of diseases and the nature of their prevention, they had been convinced about the utility of smallpox vaccination as evidenced by their wide acceptance of the procedure. It may be that since vaccination had been in vogue in India and China in some form or other for many centuries past, its wide acceptance in Sikkim might have resulted from that influence. The extent of vaccination in different zones, as revealed by the survey, is shown in Table L. It may, however, be mentioned here that due to shortage of time it had not been possible to ascertain in each case the period of time elapsing from the date of last vaccination to determine the extent of their present immunity status. Thus this table gives the record of primary vaccinations only. Among the School children, however, a large number was found to have been vaccinated more than once.

TABLE L.

State of Smallpox vaccination in different zones at the time of survey.

Zones.	Number of families visited.	Total No. of inmates.	No. vaccinated at least once.	No. unvaccinated.	Per cent vaccinated.
Central	50	250	224	26	89·6
Southern	67	446	339	107	76·0
Western	56	365	347	18	95·1
Eastern	45	253	246	7	97·2
Northern	29	146	126	20	86·3
ALL ZONES .	247	1460	1282	178	87·8

It will be seen from Table L that 87·8 per cent of the surveyed population had been vaccinated at least once, the percentages varying from 76·0 in the southern to 97·2 in the eastern zone. This figure compares well with that of Singur in 1944. Thus 12·2 per cent or 16,802 persons of the whole population have remained unvaccinated, although a certain proportion of this population would be new born babies and young infants who would normally remain unvaccinated. We are, however, unable to say to what extent revaccination should be performed. The extent of vaccination was most satisfactory in the eastern zone where the deficiency was 2·8 per cent only but it was rather unsatisfactory in the southern zone where as high as 24·0 per cent remained unvaccinated. The northern zone with a deficiency of 13·7 per cent came next in order, followed by the central zone with 10·4 per cent and the western zone with 4·9 per cent deficiencies respectively. Another important observation was that inspite of these deficiencies no case of smallpox was encountered either at the time of survey or recorded for the past 12 months, but the Gangtok Hospital had 3 cases of smallpox as given in its return for 1952.

Very little information was available regarding immunisation against other infectious diseases, but we were given to understand that inoculation against typhoid and cholera were given in exceptional cases.

Disabilities.

The common disabilities detected in the sample population were partial or complete deafness, deaf-mutism, partial blindness, loss of limb (including paralysis) and a few others. No case of total blindness was seen. Their distribution in different communities is given in Table LI.

TABLE LI.

Distribution of disabilities in the sample population according to sex and communities.

Communities.		Partially deaf.	Completely deaf.	Deaf-mute.	Partially blind.	Loss of limb.	Others.	Total. Male.	Total. Female.	Total. Both sexes.	Population.
Nepali	No.	2	1	1	1	2(F)	2	7	2	9	916 (377 F 539 M)
	%	0·37	0·19	0·19	0·19	0·53	0·37	1·3	0·53	1·0	
Sikkimese	No.	—	—	—	—	1	—	1	—	1	266 (116 F 150 M)
	%	—	—	—	—	0·67	—	0·67	—	0·37	
Lepcha	No.	1	—	—	2(F)	—	1	2	2	4	192 (77 F 115 M)
	%	0·87	—	—	2·6	—	·67	1·74	2·6	2·1	
Other Indians	No.	1	—	—	—	1	—	2	—	2	82 (22 F 60 M)
	%	1·67	—	—	—	1·67	—	3·3	—	2·4	
Tibetan	No.	—	—	—	—	—	—	—	—	—	97 (32 F 65 M)
	%	—	—	—	—	—	—	—	—	—	
Marwari	No.	—	—	—	—	—	—	—	—	—	116 (31 F 85 M)
	%	—	—	—	—	—	—	—	—	—	
All communities — Male	No.	4	1	1	1	2	3	12	—	—	1014
	%	0·4	0·1	0·1	0·1	0·2	0·3	1·2	—	—	
All communities — Female	No.	—	—	—	2	2	—	—	4	—	655
	%	—	—	—	0·3	0·3	—	—	0·61	—	
All communities — Both sexes	No.	4	1	1	3	4	3	12	4	16	1669
	%	0·24	0·06	0·06	0·18	0·24	0·18	0·72	0·24	0·96	

Altogether 0·96 per cent of the population suffered from disabilities. The rates of principal disabilities were as follows : partial deafness 0·24 per cent, complete deafness 0·06 per cent, deaf-mutism 0·06 per cent, partial blindness 0·10 per cent, loss of limb 0·24 per cent and other causes 0·16 per cent. Calculated on the above basis the number of disabled persons in the state would be 330 partially deaf, 33 completely deaf, 83 deaf-mute, 249 partially blind, 330 with loss of limb and 249 persons with other disabilities. In respect of communities the highest percentage of disabilities or 2·4 per cent, was found among the ' other ' Indians, the Lepchas (2·1 per cent) came second, followed by the Nepalis (1·0 per cent) and the Sikkimese (0·37 per cent) in order of prevalence. No disabilities was, however, detected among the Tibetans and Marwaris in the sample population. The males suffered more than the females, the ratio between male to female being 3 : 1. The age distribution and causes of disabilities are given in Table LII.

TABLE LII.

Distribution of disabilities according to cause and age groups in the sample population.

Disabilities.	Age groups (Yrs.).			Congenital.	Accident.	Disease.	Old age.	Not known.	Total.
	0—4·9	5—14·9	15+						
Partially deaf	—	1	3	—	—	—	1	3	4
Completely deaf	—	—	1	1	—	—	—	—	1
Deaf mute	—	—	1	—	—	—	—	1	1
Partially blind	1(F)	—	2(1F)	2	—	1	—	—	3
Loss of limb	1(F)	1	2(1F)	—	—	3	—	1	4
Others	0	1	2	1	1	—	—	1	3
TOTAL . . . No.	2	3	11	4	1	4	1	6	16
TOTAL . . . %	1·47	0·40	1·35	25·0	6·25	25·0	6·25	37·5	100·0
POPULATION	136	74·8	816						

The distribution of disabilities in the three age groups 0-4·9 years, 5-14·9 and 15 years and above, were 1·47, 0·40 and 1·35 per cent respectively, thus showing that this condition affected mainly the very young or the grown-ups. The causes of such disabilities, as far as could be ascertained were congenital 4 cases, accident one case, old age one case, disease 4 cases and causes not known 6 cases. There were two cases of partial blindness ascribed to congenital causes. Perhaps those due to disease like syphilis or defective maternity assistance could have been prevented provided proper facilities were made available.

Assessment of Routine Vital Statistics.

There is no organisation at present to collect routine vital statistics for the state. As this record is the foundation of all planned health work, an attempt was made to obtain information relating to births and deaths, during the past 12 months. Table LIII sets out information about terminations or pregnancies in different communities during the year.

Births :

Table LIII.

Distribution of terminations of pregnancies during the year according to communities.

Community.	Population studied.	Live-birth.			No. of still-births.	No. of abor-tions.	Birth rate.	Abor-tion rate.	Still-birth rate.
		Male.	Female.	Total.					
Nepali . .	910	7	18	25	2	2	27·2	6·9	6·9
Sikkimese . .	266	7	7	14	0	2	52·6	12·5	0·0
Lepcha . .	192	0	2	2	0	0	10·4	0·0	0·0
Tibetan . .	97	1	0	1	0	0	10·3	0·0	0·0
Marwari . .	116	3	1	4	0	0	34·5	0·0	0·0
Other Indians .	82	1	1	2	0	1	24·4	33·3	0·0
Nationality not known.	31								
Total .	1700	19	29	48	2	5	28·8	9·1	3·6

The crude birth rate for the whole state was 28·8 per mille. A wide variation was, however, noted between different communities. It was highest, 52·6 per mille among the Sikkimese and 10·4 and 10·3 per mille respectively among the Lepchas and the Tibetans. Of the remaining communities the rates were 34·5 per mille among the Marwaris, 27·2 per mille among the Nepalis and 24·4 per mille among the ' other ' Indians.

The abortion and still-birth rates in the state were 9·1 and 3·6 per cent respectively, both of which are high and indicate poor maternity help during delivery. How far some of these abortions and still-births were due to venereal or other preventable diseases, it is difficult to say. Abortions were mainly

confined to the Sikkimese and the Nepalis and still-births among the latter. The abortion rate among the Sikkimese was nearly twice as high (12·5 per cent) as that among the Nepalis (6·9 per cent). This might be related to the higher prevalence of venereal diseases in that community, as noted earlier. The number of births shown here may not be of any significance.

The sex ratio at birth according to the combined experience was 1 : 1·51, the female births being in excess. The corresponding ratios as obtained in the Singur survey in 1944 is 1 : 1·14, and in the census of 1951 for West Bengal is 1·08 : 1.

Deaths :

The information collected regarding deaths in different communities is given in Table LIV.

TABLE LIV.

Distribution of deaths in different communities by age groups during the year.

Nationality.	Infants.			Children upto 15 years.			Adults.			All Groups.			Rates per Mille.		
	Male (19).	Female (29).	Total (48).	Male (500).	Female (336).	Total (836).	Male (515).	Female (301).	Total (816).	Male (1034).	Female (666).	Total (1700).	Male.	Female.	Total.
Nepali (916)	4	3	7	2	1	3	2	2	4	8	6	14	14·8	15·9	15·3
Sikkimese (266)	1	0	1	1	3	4	0	2	2	2	5	7	13·3	43·1	26·3
Lepcha (192)	0	0	0	0	0	0	1	1	2	1	1	2	8·7	13·0	10·4
Tibetan (97)	0	1	1	0	0	0	1	0	1	1	1	2	15·3	31·2	20·6
Marwari (116)	1	0	1	0	0	0	0	1	1	1	1	2	11·8	32·2	17·2
Other Indian and Not known (113) .	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL .	6	4	10	3	4	7	4	6	10	13	14	27			15·9
RATES .	316	138	208	6·0	11·6	8·4	7·8	19·9	12·25	12·6	21·0	15·9			

N. B.—Figures in parenthesis are population studied in each group.

Crude Death and Infant Mortality Rate :

The crude death rate for the state was found to be 15·9 per mille and the infant mortality rate as 208 per mille. Thus, while the crude death rate was found to be lower than that for India the infant mortality rate was much higher, which again shows the lack or inadequacy of infant and maternity assistance, if any. The rates for the remaining two broad groups, namely, children below 15 years and persons above 15 years were 8·4 and 12·25 per mille respectively. Among the different communities the Sikkimese who had the highest birth rate also showed the highest death rate (26·3 per mille). The other communities coming, in order, were the Tibetans, Marwaris, Nepalis and Lepchas with death rates of 20·6, 17·2, 15·3 and 10·4 per mille respectively. Thus, among the Lepchas both the birth and the death rates were the same and the lowest. From this picture perhaps it would not be wrong to assume that broadly speaking the Lepchas are the dwindling race in Sikkim. The infant mortality rate was 208, comprising 316 for the males and 138 for the females. The proportion was reversed in higher age groups, overall death rate among the females being 21·0 per mille as against 12·6 per mille among the males. This difference in rates among the sexes was noted in all communities but it was markedly high among the Sikkimese and fairly high among the Tibetans and the Marwaris. It is, however, not possible from this brief investigation to suggest the reasons for this wide difference, except perhaps the smallness of the sample.

Causes of Death :

In the absence of qualified medical attendance and facilities for maternal care, the causes of death could not be ascertained with certainty. But as far as could be gathered from the histories given by the family members the deaths could be roughly ascribed to the following causes ; birth injury 6, infectious diseases 3, non-infectious diseases 7, other causes 7 and causes not known 4 giving a total of 27 deaths.

CHAPTER VII.

Summary and Conclusions.

1. A rapid medical and health survey of the Sikkim state was conducted during the period of 6 weeks from the 24th September to the 3rd November, 1953, by a party from the All India Institute of Hygiene and Public Health, Calcutta. The data were collected in appropriate schedules previously prepared for this purpose. The programme of work was drawn in consultation with the Sikkim authorities who helped the party with the necessary transport, accommodation and services of an interpreter and a few ancillary personnel in addition to giving publicity to enlist the co-operation of the people.

2. The main purpose of the survey was to obtain an integrated picture of the community health and sickness, their immunity and nutritional status, socio-economic, housing and environmental conditions against the background of the existing medical and sanitary facilities available in the state, so as to be able (*a*) to crystallise the main public health problems of the state and to suggest necessary measures for their amelioration and control and (*b*) to help in the organisation of the any future public health set up in the state.

3. For the purpose of the survey the whole state was divided into 5 zones, *viz.*, central, southern, western, eastern and northern and these were visited in the order mentioned.

4. The work consisted of physical examination of individuals with their medical and social histories, recording of family data including births and deaths, collection and examination of laboratory specimens, insects and rodents and assessment of environmental and socio-economic conditions of the people and the villages, etc.

5. Geographically Sikkim lies between Tibet in the North, Darjeeling district in the south, Bhutan in the east and Nepal on the west. Its area is 2,818 sq. miles with a population of 137,725, the density being 50 per sq. mile. The population is practically wholly rural, Gangtok, the capital, being the only town. It is inhabited by several communities such as Nepalis, Sikkimese, Lepchas, Tibetans and Indians like the Marwaris and others. The main religions of the people of the state are: (i) Hinduism, (ii) Buddhism and (iii) Christianity, although a few Muslims, Jains and Sikhs are also there. Of the people, 71 per cent are Hindus, 28·6 per cent Buddhists and the rest 0·4 per cent are Christians, Muslims, Jains and Sikhs, etc.

6. The country is mountainous, being a part of the Himalayan system. Its altitude varies from 1,000 ft. in the valleys to 5,700 ft. at Gangtok in the central and 12,300 ft., at Gantong in the north. The climate varies with the altitude, the valleys being warm and humid during the greater part of the year while regions between 4,000—6,000 ft. have pleasant and moderate climates

and at places, like Lachen or Lachung (nearly 9,000 ft.), the climate is cold and severe in the winter. The annual rainfall is heavy, varying from 64" to 170" at different places. Sikkim is on the main trade route from India to Tibet which passes through Gangtok.

7. The communications in the state are rather ill developed, important places, though connected by roads, are not motorable for the greater part of the year when the people have to move on foot or ride. Post and telegraphic communications are available only in few places.

8. The country has a wide variety of faunna and flora including malaria carrying mosquitoes and sandflies which transmit kala-azar. Useful minerals, medicinal plants and rich forests are some of the assets of the State.

9. Soil is similar to that of the neighbouring Darjeeling area and its subsoil water level is high.

10. Irrigation of rice fields, particularly in the valleys, is through small channels from springs and rivers. It causes water-logging and help in the breeding of malaria carrying mosquitoes, particularly in the south.

11. The average number of houses per sq. mile in the state is 9. The villages and the houses therein are scattered and approachable with difficulty except in the Lachen and Lachung areas where these are compact like the bazaar areas. The houses are generally often extremely insanitary, people and animals living in the same house or compound. Except in a few houses of the better class there is no water or latrine facilities. Water is mainly drawn from springs and occasionally from rivers and not subjected to any treatment before drinking. Majority of the houses are dark and ill-ventilated and are infested with roaches, and mice and other rodents and insects like anopheline and a culicine mosquitoes and houseflies.

12. The anthropometric measurements of the communities show some differences among one another. Among the indigenous races, the Tibetans and the Sikkimese are the tallest and the heaviest while the Lepchas and the Nepali females are the shortest. The weights also vary proportionately as the heights. Females, as usual, were comparatively less taller and heavier than males. Among the Marwaris, males were generally taller than any of the local races but their females were not so. The period of highest development, both for height and weight, was between 12 to 18 years of age.

13. The political history and administrative set up of the State have been described.

14. The total number of persons included in the survey was 1700, *i.e.*, 6·2 per cent of the total population of the villages surveyed. The male to female ratio being 1·55 : 1·1 as against 1·1 : 1 in the census population. The proportions of different communities included in the sample population and their religions were almost in the same order as obtained by the Census of 1951, their proportions among the population surveyed being as follows : Nepalis—54·9 per cent, Sikkimese—15.9 per cent, Lepchas—11·5 per cent, Tibetans—5·8 per cent, Marwari and 'other' Indians—11·9 per cent.

15. The educational facilities available in the state are indeed meagre, there being only one high school for boys and another for girls at Gangtok. The total number of scholars in these schools being 675. There are only lower grade schools at other important centres, seven of which were visited by us. The number of scholars varied from 25 to 120. The school buildings, except those at Gangtok, were found to be unsatisfactory from the point of view of health and sanitation.

Contrary to our expectations, a fairly high degree of literacy of the traditional type was observed. The percentage of literates including just literates is all age groups was 67·8 per cent in the males and 37·6 per cent in the females, the average being 56·0 per cent. Even excluding the schools children the literacy rate was 37·1 per cent among the adult population, varying from 25·0 per cent in the southern to 48·0 per cent in the central zones.

16. In connection with the religious institutions various festivals of the Hindus and Buddhists have been described.

17. 'Rakshi', a kind of alcohol prepared from fermented millets or buckwheats, is used as an almost universal drink by the local people, particularly the Lepchas. Next to alcohol, the common addiction was tobacco. Even amongst children 12·0 per cent indulge in alcohol and 15·0 per cent in tobacco. Besides the above, 1·2 per cent of the population indulge in opium.

18. The main occupation of the people of the state is agriculture in which a large number of women and a few children are also employed. A few are employed as clerks and state officials, teachers, petty traders and the rest are labourers and domestic servants. Sweepers, washermen, barbers and cobblers who are conspicuously absent among the local people, are usually outsiders. Artisans are also few.

19. The main agricultural product is maize, the staple food of the majority of the people. Millet, rice, buck-wheat, black-gram and *moong* dal are the other agricultural products. Cardamom is extensively grown as cash crop. Amongst vegetables and fruits, potato and oranges are grown extensively and exported and apples to a certain extent.

20. Animals and live-stock like cattles, pigs, goats and poultry are widely kept and utilised as food except by the Nepali Brahmin and the Marwaris. Majority of the Nepali Hindus avoid pork which is very popular with the Buddhists.

21. The main commodities of trade are cardamom, orange, potato, wool from Tibet, some cereals and dal. These are mainly in the hands of the Marwari traders. There are bazars at important places but only isolated shops elsewhere.

There is no organised industry other than manufacture of country liquors. Making of bamboo baskets and woollen drapes are the few products locally made.

22. The medical and public health facilities consist of three hospitals with their out-patients departments and seven dispensaries, including the one at Rangpo which is maintained by the Central P.W.D. Three of the dispensaries are run by the Christian Missions and the rest by the state. They are supposed to cater to the needs of a population of nearly 94,000. The largest hospital of the state is at Gangtok with 60 beds, a tuberculosis annexe of 6 beds, X-ray, diathermy and a small clinical side-room. The total beds in other hospitals number only 20 plus 3 emergency beds at Rangpo. The medical staff of the state consists of the Chief Medical Officer and 4 assistant surgeons including the doctor in charge of the Rangpo dispensary. Besides the Chief Medical Officer only one of them is a medical graduate. The dispensaries are managed by qualified compounders who render medical relief. There are also two mobile dispensaries for epidemic duties. The ancillary staff consists of a few trained nurses, compounders and dressers and other menial staff. The quality of medical care engendered by the dispensaries which are in charge of compounders is necessarily poor and inadequate. There is no separate private or state midwifery service nor there is any qualified public health staff like sanitary inspector, health assistants, etc. Only a few vaccinators and sweepers are employed for vaccination and disposal of night soil and refuse in selected places. There is no organisation for the collection of vital statistics, nor any public health laboratory, but samples of food and water are sent to Darjeeling for analysis.

23. The total number of family units examined for family size was 246 comprising 1,400 individuals. The average size thus works out to be 5·69 as against 5·6 per census house (rural—5·69 and urban—3·95). The families are generally closed ones having little contacts with places outside the state. Even inter-state movement is restricted to attending bazars, fairs and festivals. On this account, the state has been spared from large scale epidemics, excepting Influenza in 1918-19 and relapsing and Kala-azar a few years earlier.

There is a great tendency for all or the large majority of the families to lead independent lives, 91·4 per cent of them being single, 8·3 per cent joint and only 0·3 per cent multi. The average sizes of these three categories of families were 5·4, 8·3 and 6 respectively, the most common family size being 5. The responsibilities of the joint families was thus greater. Fortunately a great majority of those that should have earned their wages were actually doing so. As a community, the Tibetans and as a religious group, the Christians were all single families. Only about 7 per cent of the families among the Nepalis and the Sikkimese were joint.

24. The principal spoken languages or dialects are Nepali, Tibetan, Sikkimese—an offshoot of Tibetan, Lepcha and Hindi. Generally each community speaks its own dialect but exceptions were not uncommon. For instance, 37·8 per cent of the Sikkimese had Tibetan as their mother tongue.

25. Marriage rates and customs differ in different religions. The proportion of married among the Hindus was highest ; 63 per cent of the male and 84·2 per cent of the females above 15 years of age, were married. Buddhist came intermediate, while among the Christians the percentage of married people of both sexes are the lowest, being only 29·4 for males and 25·0 for the

females. Amongst Hindus the age at marriage is earlier and none remains unmarried after 45 years, but early marriages are not common among other religions. Polygamy is practised among the Nepalis and polyandry among the Buddhists in the north. The percentage of widows was higher (21·1 per cent) among the Buddhists than among the Hindus (11·3 per cent).

26. Economically, half of the families were either poor or very poor, 27·8 per cent middle class and 17·8 per cent rich. The Marwaris were, however, the richest. Among the local communities as high as 59 per cent were either poor or very poor, the percentages varying from 44·4 per cent among the Tibetans to 61·0 per cent among the Nepalis who are naturally the poorest. This is supported by the amount of land holdings of the respective communities.

27. The majority of the people are ignorant about the causation or prevention of disease, being demonistic or deisitic in outlook on health matters Personal hygiene is extremely poor being reluctant to take bath or otherwise keep themselves clean. That is why pediculosis, scabies, skin diseases, including ulcers, worm infestations, etc., are very widespread among them.

28. There is no common recreational facilities for the people at large. One cinema house has, however, been recently installed at Gangtok Bazar and the schools generally have some play grounds. Some upper class families and a few officials have their personal radio sets, and there is a club at Gangtok for higher officials.

29. *State of health and disease.*—Morbidity data were collected from three sources, *viz.*, (*a*) Sickness at the time of survey, (*b*) Sickness during the preceding twelve months and (*c*) annual returns from hospitals and dispensaries.

(*a*) At the time of the survey 15 per cent of the population were found to be either sick or in indifferent health. Of these 1·5 per cent were acutely ill, 4·4 per cent chronically ill and 9·9 per cent in indifferent health. This did not include such clinical conditions as tonsils and adenoids, caries teeth, goitre and helminthic infestations which did not produce any apparent symptoms.

The highest incidence of total sickness, *e.g.*, 28·7 per cent was in the southern zone; the rates for other zones were 19·6 per cent for the eastern, 16·6 per cent for the northern, 11·7 per cent for the western and 7·5 per cent for the central. In respect of acute and chronic sickness only, the rates were as follows: southern—15·35 per cent, eastern—7·2 per cent, northern—4·4 per cent, western—3·2 per cent, and central—2·07 per cent, as against 5·9 per cent for the whole state. The proportion of the persons in indifferent health was however the lowest in the southern and highest in the northern, the respective proportions in different zones being as follows: northern—73·3 per cent, western—72·1 per cent, central—71·8 per cent, eastern—63·1 per cent and southern—46·5 per cent.

The principal diseases detected during the survey in order of their prevalence are: (1) hookworm, (2) scabies, warts and other skin diseases, (3) malaria, (4) kala-azar, (5) tuberculosis, (6) tapeworm, (7) venereal diseases, (8) roundworm, (9) other fevers, (10) epilepsy and other nervous

disorders, (11) throat infections and (12) tropical ulcer. The incidence of these diseases varied from zone to zone. The main problems in the southern zone were: malaria, kala-azar, hookworm and tropical ulcer, in the eastern zone—hookworm, malaria, kala-azar, venereal diseases, skin diseases and nervous disorders, in the western zone—hookworm, tuberculosis, venereal diseases and skin diseases, in the northern zone—helminthic diseases, specially tapeworm and hookworm, and venereal diseases, while in the central zone which had the lowest sickness rate, the main diseases were venereal diseases and skin diseases, tuberculosis, hookworm and throat infections. Other infectious diseases like enteric fever, whooping cough, mumps, measles, influenza and diarrhoea and dysentery, though not seen at the time of the survey, also occurred during the year. Among other clinical states which did not give rise to subjective symptoms nor interfered with the normal life of the people, were goitre, caries and other dental disorders, tonsils and adenoids and pediculosis. Their total incidence rate was as high as 20·0 per cent in the sample. Among these, goitre was widely prevalent everywhere except at higher altitudes of the northern zone.

(*b*) During the preceding twelve months, 31·5 per cent of the persons examined suffered from one or the other disease. Of these, malaria headed the list with an incidence rate of 944 per 10,000. The rates per 10,000 for other principal diseases were, other fevers—508, whooping cough—191, diarrhoea dysentery—137, mumps—119, influenza—60, eye diseases—42, tapeworm—48, venereal diseases—41 and chicken-pox—36.

According to the above rates it is estimated that at any particular moment at least 20,659 persons would be unwell and the total number of persons sick during the year would be 43,383. These figures are important for planning health measures for the state.

(*c*) The hospital and dispensary statistics for the year 1952 showed an almost similar proportions of various diseases among those who attended these institutions. Unfortunately the cases not being differentiated as old and new a strict comparison of these figures cannot be made with the survey data.

30. *Malaria.*—Malaria causes the highest amount of sickness in the state, the rate being 944 per 10,000. On a conservative estimate 15,000 people suffer from this disease every year, the most severely affected area being the southern zone where the spleen rate was 47·3 per cent and the parasite rate 13·0 per cent and where at least 30 per cent of all sicknesses was due to this disease alone. It is also prevalent, more or less, in other zones like the eastern, western and the northern but nowhere it was endemic above the altitude above 3,000 ft. The areas upto an elevation of 2,000 ft. were either hyper or highly endemic as seen by the spleen and parasite rates. The few cases that were encountered in altitudes higher than these, were mostly due to infections contracted lower down. All the three important species of malaria parasites were seen but *P. falciparum* was the predominant type at the time of the survey. Among the principal vector mosquitoes, *A. minimus* was the only species encountered in fairly large numbers, in the areas where malaria was endemic. This mosquito was found to be breeding rather heavily in the back waters of the rivers Teesta and Rongpo, irrigation channels and hill streams.

31. *Kala-azar.*—Like malaria kala-azar is prevalent mainly in the southern zone and to a lesser extent in the western zone. At the time of the survey, 8·8 per cent of the population was sick with this disease in the southern zone and another 7 per cent gave history of having suffered from it during the preceding 12 months. In the eastern and western zones the total incidence of this disease is about 1 per cent during the corresponding period. Also, 2·7 per cent of all hospital attendances during 1952 were due to kala-azar. Out of 35 samples of blood collected from suspected cases of kala-azar 22 (64·3 per cent) were positive to aldehyde test. Thus the total sickness rate of kala-azar during the year was 0·67 per cent, the estimated number of cases in the whole state being 2,300. The disease was more prevalent among the adults than among children below 15 years in which it was the lowest. No kala-azar was found present at or above the elevation of 5,000 ft.

32. *Tuberculosis.*—At the time of survey 19 cases of tuberculosis were detected and 4 more persons gave history of having suffered from it during the year, the overall rate thus being 138 per 10,000 persons or roughly 1,900 cases in the whole state. According to the hospital returns of 1952, 54 cases were admitted indoor and 211 cases were treated in the outdoor. But the interesting feature is that nearly half of the cases were non-pulmonary type which throws great suspicion on the local cattle population.

The tuberculosis infection rates were 33·0, 26·5, 20·9 and 20·4 per cent in the central, southern, eastern and western zones respectively, the overall rate being 27·9 per cent. Time did not permit to carry out tuberculin tests in the northern zone. Thus, both tuberculin infection and morbidity rates lie intermediate between the rural and urban rates, found in India. Dr. Ukil obtained higher figures for Darjeeling and Kalimpong in 1937. No child below 5 years was tuberculin positive. A progressive rise in the rates was noted beginning from 22·3 per cent in the age group 5-10 years to 38·2 per cent in the age groups above 45 years. Peculiarly, in all age groups, except those above 45 years, the female rates were higher than rates in males, and the intensity of reaction was higher in the lower age groups than in the upper. Amongst the communities, the Tibetans showed the highest incidence, *e.g.*, 35·9 per cent, and the 'other' Indians the lowest, 20·5 per cent. The rates amongst the Lepchas the Sikkimese, Nepalis and Marwaris were 30·9, 30·5, 27·4 and 22·5 per cent respectively. The Marwari females showed the highest infection rate among the two sexes, *e.g.*, 44·4 per cent.

33. *Venereal disease.*—Both syphilis and gonorrhoea were encountered in all zones except the southern ; the overall incidence rate was roughly 1 per cent or 1,370 cases in the whole state. In the hospital returns for 1952 0·6 per cent of all admissions were due to these diseases and all zones returned cases. The highest incidence was found in the northern zone, followed by the eastern, western and the central, in order of prevalence. Out 47 samples of blood tested for Wassermann reaction or Khan test 6 or 12·8 per cent were positive, 36·4 per cent being among the Sikkimese and 13·3 per cent among the Nepalis. Samples from other communities and those collected from the southern and eastern zones were negative.

34. *Stool parasites.*—Infestation with intestinal helminthic parasites like hookworm, roundworm, tapeworm and trichuris is widely prevalent throughout the state. The total infection rate in the whole state was found to be 6·8 per cent, *i.e.*, nearly 9,400 clinical cases. Two-thirds of this number suffer from hookworm alone and there are many times this number, who suffer but do not present symptoms. Of the 275 specimens of stool examined, 40·4 per cent were positive for hookworm, 32·7 per cent for roundworm, 19·3 per cent for tapeworm and 20·7 per cent for trichuris. The percentage of stool positives was lowest in the northern zone and highest in the southern ; whereas this was just reversed for tapeworm, no sample from the southern zone being positive for this worm. There was practically no zonal difference for roundworm. Among the communities, Nepalis showed the highest incidence of hookworm and roundworm and the Tibetans that of tapeworm with the Sikkimese and the Lepchas coming as close second.

35. *Goitre.*—The overall incidence rate of goitre, as obtained during the survey, was 7·4 per cent. Thus, people with goitre in the whole state number nearly 10,000. The incidence rate varied in different zones, the rates being 1·1 per cent in the northern, 5·5 per cent in the central, 7·1 per cent in the western, 8·4 per cent in the southern and 13·6 per cent in the eastern. About 10 per cent of the total admissions in the hospitals and dispensaries in the state were due to this cause. The rate in the females was twice as high (10·6 per cent) as that in the males (5·4 per cent). The highest rate (10 per cent) was seen among children between 5-15 years, the age at which the condition becomes clinically detectable. Unlike malaria and kala-azar, the majority of goitre cases was found in altitudes between 5,000—6,000 ft.

36. *Tropical ulcer.*—Ulcers of the skin were quite common as seen from the hospital returns in which 6·8 per cent of the total admissions were due to this cause. Seven cases of tropical ulcer was encountered by us, all in the southern zone, and these were confirmed in the laboratory.

37. *Haemoglobin.*—The overall haemoglobin deficiency was high ; 56·8 per cent of the population showed value less than 75 per cent and another 1·7 per cent showed haemoglobin values less than 50 per cent. Females generally showed higher values than males. Among the different communities the Sikkimese had higher haemoglobin values than the other communities, the Lepchas and the Tibetans coming next. The Nepalis who showed the highest malaria rate and hookworm infestations, had the lowest values for haemoglobin. The percentage of haemoglobin deficiencies decreased as the altitude increased. None of the persons examined below 3,000 ft. had haemoglobin values above 90 per cent, while 2·7 per cent of those living between 4,000—5,000 ft. and 9·7 per cent of those living at altitudes higher than 5,000 ft. had haemoglobin values above 90 per cent, irrespective of the communities.

38. *Nutritional status and diet.*— One thousand two hundred and three persons were examined for their nutritional status. Nearly half (48·7 per cent) showed good nutrition, it was fair in 29·3 per cent, while in the rest, 22 per cent, it was poor. The Tibetans showed the best nutritional status and the Nepalis the poorest while the other communities which came next in order

were the Sikkimese, the Lepchas, the Nepalis and the Marwaris. This might be due to the eating of maize which forms the principal cereal of their diet. Of the persons examined, 23·4 per cent were not consuming meat but the rest were meat-eaters. Among the latter, the percentages of people consuming various types of meat were mutton-72·1, poultry-60·8, pork-38·3, beef-24·0, buffallo-15·2 and other meat-21·5. The Marwaris and the Brahmins among the Nepali Hindus were strictly vegetarians but 3·7 per cent of the Sikkimese, 17·7 per cent of the Tibetans and 23·0 per cent of the Nepalis were also not consuming meat.

39. *Milk and tea.*—The consumption of milk among the communities, except the Marwaris, was very poor ; only one person out of every three consumed it. In contrast, tea as a beverage, was more popular among all communities.

40. *State of immunisation.*—Vaccination against small-pox is the only immunisation measure carried out. Among the persons examined, 87·8 per cent had been vaccinated at least once. This percentage varied from 76·0 in the southern to 97·2 in the eastern zone. Thus 12·2 per cent or 16,802 persons of the whole population, including the new born babies and some young infants, have remained unvaccinated.

41. *Disabilities.*—Nearly 1 per cent of the individuals examined had some disabilities ; the rates for the principal types were as follows : partial deafness-0·24 per cent, complete deafness-0·06 per cent, deaf-mutism-0·06 per cent, partial blindness-0·18 per cent, loss of limb-0·24 per cent and other causes-0·18 per cent. Thus, the probable number of disabled persons in the state works out to be 1,324. The condition affected mainly the very young and the grown ups. The causes, as far as could be ascertained, were : congenital-4, accident-1, old age-1, disease-4 and cause unknown-6.

42. *Vital statistics.*—There is no organisation in the state to collect vital statistics. From the data collected during the survey the crude birth rate was found to be 28·8 per mille and the crude death rate 15·9 per mille.

A wide variation in birth rate was, however, noted among the different communities. It was 52·6 per mille or the highest amongst the Sikkimese and it was lowest 10·4 and 10·3 per mille among the Lepchas and the Tibetans respectively. The crude birth rates for the Marwaris, Nepalis and other Indians were 34·5, 27·2 and 24·4 per mille respectively.

The abortion and still births rates in the state were 9·1 and 3·6 per cent respectively indicating poor maternal assistance. It might be due to V.D. infection in some cases. The abortion rate for the Sikkimese was twice as high (12·4 per cent.) as that for the Nepalis (6·9 per cent). The sex ratio at birth was 1 : 1·51, the female birth being in excess.

The infant mortality rate was 208 per mille, comprising 316 for males and 138 for females, which are fairly high. The age specific death rates for the two broad groups, excluding infants, were 8·4 per mille for children below

15 years and 12·25 per mille for persons above 15 years. As with the birth rate the Sikkimese had the highest death rate (26·3 per mille) as well. The corresponding rates for other communities were 20·6 per mille for the Tibetans 17·2 for the Marwaris, 15·3 for the Nepalis and 10·4 for the Lepchas. Thus, among the Lepchas both birth and death rates were the same and the lowest.

The causes of these deaths, as far as could be ascertained, were : birth injury-6, infectious diseases-3, non-infectious diseases-7, other causes-7 and causes not known-4, total-27.

CHAPTER—VIII.

Recommendations

In the foregoing chapters we have analysed the health conditions of the people of the state against the prevailing socio-economic conditions. The survey has enabled us to crystallise the main problems so as to be able to suggest necessary measures against them. These form the basis of our recommendations.

1. THE PROBLEMS OF THE STATE.

A. Medical.

(1) The major endemic diseases are :—

(1) malaria

(2) hookworm

(3) kala-azar

(4) tuberculosis

and

(5) venereal diseases

(2) Other endemic diseases include :

(1) goitre

and

(2) tropical ulcer

(3) Diseases due to bad personal hygiene, *e.g.*,

(1) pediculosis and

(2) scabies

(4) Anaemia and other nutritional disorders and

(5) Other infectious diseases which though endemic, do not form a special problem of the state

(1) undiagnosed fevers

(2) Pneumonia and lung diseases

(3) colds, cough and throat infections

(4) diarrhoea and dysentery and

(5) childhood diseases like whooping-cough, measles, mumps and chickenpox.

B. PUBLIC HEALTH :

(1) Absence of vital statistics.

(2) Deficiency of immunisation programme against smallpox.

(3) High infant mortality rate.

(4) High abortion and still-birth rates.

(5) Poor nutrition in certain communities.

(6) Inadequate availability of water and unprotected supplies in certain areas.

(7) Absence of latrines, leading to indiscriminate soil pollution.

(8) Insanitary housing conditions.

(9) Fly and mosquito-breeding.

C. SOCIO-ECONOMIC :

(1) Inadequate medical facilities for diagnosis and treatment of the diseases above mentioned owing to insufficient number of hospital beds and lack of laboratory facilities.

(2) Lack of isolation facilities in hospital.

(3) Dearth of qualified medical, public health and other ancillary personnel.

(4) Absence of a public health laboratory.

(5) Poor sanitation of schools.

(6) Superstition and lack of health knowledge of the people.

(7) Inadequate road and postal communications.

II. PRINCIPAL MEASURES PROPOSED :

1. *Against Malaria :*

(1) Since *A. minimus*, the probable vector, is highly sensitive to D.D.T. and other residual insecticides, we suggest indoor-residual spraying with D.D.T. in the endemic villages of the southern zone, in particular. For this, we suggest that two anti-malaria units be stationed at Singtam Bazar, where hospital and laboratory facilities are available and one each at Naya bazar in the west, Rhenock in the east and Dikchu in the north. Anti-larval measures would not be feasible, considering the enormous number of breeding places to be tackled and frequency of the application of insecticides. Permanent measures like drainage, etc., can be adopted only after a detailed survey.

(2) Provision of anti-malarial drugs like quinine, paludrine, 4 and 8-aminoquinolines for treatment of cases and individual prophylaxis as the need arises.

2. *Against hookworm :*

(1) Provision of facilities for laboratory diagnosis, followed by treatment with drugs like tetrachlor-ethylene or cashew-nut-shell oil if available, in hospitals and through mobile dispensaries which will operate in endemic areas to reduce the reservoir, as far as possible.

(2) Introduction of suitable latrines in bazars, schools and in families, wherever possible.

(3) Health educational measures for the people.

3. *Against Kala-azar :*

(1) Facilities for laboratory diagnosis and treatment by pentavalent antimony compounds.

(2) Anti-sandfly measures—particularly spraying of cattlesheds, piggeries and inside of rooms with D.D.T. This should be undertaken by the anti-malaria staff.

4. *Against Tuberculosis :*

(1) Provision of more beds in the Gangtok Hospital Annexe and opening up new beds in the Namchi Hospital along with the provision of diagnostic facilities. But until electricity comes in Namchi, facilities for X-ray should be obtained from the Gangtok Hospital as far as possible.

(2) Mass B.C.G. vaccination campaign in the state.

(3) Tuberculin testing of cattle population of the state and to take such measures as to eradicate bovine tuberculosis, if there be any.

(4) Improvement in the supply and consumption of milk particularly among children. For this, free milk canteens can be opened in the schools, beginning in the southern zone.

5. *Against Venereal and other Skin diseases :*

(1) Provision of diagnosis and treatment facilities in the main hospitals by qualified medical personnel only.

(2) Special attention should be directed to the police and the military personnel of the state and pregnant mothers.

6. *Against Goitre and Tropical Ulcer :*

These problems need special investigation before any measure can be suggested for their control. Until that is done, symptomatic treatment is suggested.

7. For the remaining medical problems, we suggest improvement of personal hygiene through health education and provision of facilities for isolation and treatment where the necessity arises, improvement of diet and general sanitation.

8. *Against the Public Health Problems :—*

(1) An organisation for the collection of vital statistics which does not exist, should be started immediately.

(2) Vaccination against smallpox should be made compulsory and the necessary staff provided. It is also desirable that vaccination should be undertaken at the border points like Chungthan and Mangan Bazaar in the north or near the Nathu La Pass in the north-east, if possible, Rhenock Bazaar in the east and Rangpo in the south.

(3) For preventing high infant mortality, abortions and still-births, a maternity service under qualified personnel would be needed. A few maternity beds should be provided in each of the three hospitals of the state included in the proposed health units.

(4) The problem of improvement of water supply, housing and other environmental sanitation including the provision and popularisation of latrines, etc., should be undertaken in conjunction with the Engineering Department of the state. A beginning can be made in this direction at Gangtok, where an Area Committee to look after the environmental sanitation of the town, may be formed.

9. *Against Socio-economic problems :—*

(*i*) Extension of beds in the existing hospitals and opening up of new hospitals and dispensaries as suggested below :

(1) *Gangtok.*—The present bed strength (60) of the hospital including the number of beds for tuberculosis should be increased. This should include (*a*) a labour ward of 6 beds and 6 more beds for tuberculosis, (*b*) a child welfare and maternity clinic at the Gangtok hospital, and (*c*) provision in the hospital of a small isolation ward of at least two beds.

(2) *Singtam Bazaar.*—The present bed strength of 4 should be increased to 12 including 2 beds for labour cases. There should also be provision for 4 emergency beds, 2 of which can be utilised for isolation purposes, if required.

(3) *Namchi.*—The present bed strength of 16 should be increased to 24 which should include 4 beds for maternity and 4 for tuberculosis.

(4) *Rongpo.*—The three emergency beds at the dispensary should be raised to 4 and maintained permanently.

(5) New hospitals and dispensaries should be started in the following places :—

(a) *At Rhenock.*—A 10 bedded hospital with 2 maternity beds with provision for extension whenever necessary.

(b) *At Mangan Bazaar.*—A 6 bedded hospital with 2 maternity beds with provision for extension whenever necessary.

(c) Establishment of a dispensary at Pakyong as a part of the proposed health unit at Rhenock.

(*ii*) Adequate medical, public health and auxilliary staff which are essential for the reorganisation of the medical and health service of the state do not exist at present. In order to meet these deficiencies, the state should get their own people trained for the purposes, as quickly as possible. During the interim period, however, qualified personnel from outside the state should be recruited to run the organisation.

(a) A public health laboratory with a qualified bacteriologist incharge, should be set up at Gangtok for examination of both clinical and public health material. This should also form a part of the proposed training centre for the auxilliary personnel.

(b) The managing committees of the schools should be requested to provide adequate drinking water supplies, latrines and urinal facilities within the easy reach of the scholars. Some of the school buildings need immediate repairs and extension. It should be better to rebuild them if possible, on sanitary lines, with adequate ventilation, lighting and sitting arrangements. Teaching of Hygiene in the schools should be improved and the services of medical officers of the hospitals or those of the proposed units should be utilised.

(c) Recreational facilities should be provided not only in schools but also for the public. A small library may be added to every school.

(d) The financial position of the schools need immediate improvement and the state should come to their help as far as possible.

(e) General health educational measures should be introduced through (*a*) School health programme, (*b*) public health staff, (*c*) posters, exhibitions, cinema shows of health films produced in local language including Hindi and (*d*) through mobile vans wherever it can go.

(*iii*) For the successful operation of the above measures, improvement of the communication system is an urgent necessity.

(*iv*) *General measures.*—The state is rich in its forest wealth. The possibility of extending the cultivation of such valuable medicinal plants as digitalis, ipecacuanha, ephedra, artemesia which grows wildly should be explored. In addition, efforts should be made to grow other useful plants such as cinchona (which grows in neighbouring Darjeeling) and pyrethrum particularly in the lower altitudes in the west, if the soil there is found suitable. Although the neighbouring Darjeeling area abounds in tea gardens, none exist in Sikkim

the cultivation of tea and coffee, as a state enterprise may be considered. The cultivation of apples, oranges, potatoes and cardamom which already bring good revenue to the state should be extended and organised properly.

The state abounds in good varieties of ferns, orchids and flowers of the temperate regions for which there is a good demand from outside India. If the state develops these resources and maintain its own nursery under an expert and exports these products, as has been done by a private enterprise, a source of some revenue to the state may be found.

For improving the milk supply and providing milk to school children of the state, it should maintain its own dairy at places like Gangtok, Namchi, Rhenock, etc., and supply milk to the hospitals, health units, schools and the public at a reasonable rate. At present only Gangtok, of all places in the state, is electrified, but there is a great possibility of developing hydro-electric power from the river Teesta. If power is made available, cottage industries can be expanded and other industries and tea gardens can be established, particularly as labour will be cheap. Availability of electric power, thus generated will go a long way in not only starting industries but will also help greatly the hospitals and laboratories for being equipped with up-to-date instruments, for no modern hospital or laboratory can go without them.

III. Proposed Health Organisation and Staff

It is proposed that the administration of Health services in the state should be organised as a single department under the Executive Councillor incharge of health with the Chief Medical Officer as its executive head. He will be incharge of both curative and preventive services.

For the purposes of administration, the arbitrary division of the state into the five zones, as was done for the conduction of survey, may be maintained. These are : Central, Southern, Western, Eastern and the Northern. The exact boundary for each division will be worked out by the local authorities. Each of these zones will have a health unit placed at the most important and central place to administer both curative and preventive services for approximately 25-30000 people. The units may essentially be run on the model of Singur Health Unit in West Bengal. The existing hospitals and dispensaries should be absorbed into the scheme and as far as practicable, health units may conveniently be placed in the localities where they exist. We tentatively suggest that the following places be chosen for the location of these units, e.g. (1) Gangtok for the Central zone, (2) Singtam Bazaar for the southern, (3) Namchi for the western, (4) Rhenock for the eastern and (5) Mangan Bazaar for the northern.

A Health Advisory Committee under the chairmanship of the Dewan of the state may be established at the Headquarters to advice the department on the policies of health administration. This committee should be composed

of the representatives of different nation-building departments, particularly agriculture, education, engineering, and also include some notary public besides representatives from the health department. The above organisational set up is shown diagrammatically in page 109.

The main objectives of the organisation will be as follows :—

A. *Primary.*

(1) to cater medical relief to as many sick persons as possible,

(2) to collect vital statistics,

(3) to carry out smallpox vaccination and other immunisations,

(4) to control and, if possible, eradicate malaria, kala-azar, tuberculosis and venereal disease,

(5) to control and, if possible, eradicate intestinal worm infestations, and

(6) to improve the environmental sanitation, particulary water supply and disposal of night soil and refuse.

B. *Secondary.*

(1) to control food and drugs,

(2) to improve school health and sanitation,

(3) to organise child welfare and maternity services, and

(4) to improve the health knowledge and outlook of the people through health education.

C. *Other objectives.*

(1) to improve socio-economic conditions by :—

(*a*) encouraging cereal, vegetable, fruit and other food production through improvement of agriculture in an organised manner,

(*b*) introducing dairies, poultry and animal husbandry on scientific lines,

(*c*) encouraging cultivation of medicinal plants like cinchona, digitalis, artemesia, ephedra, ipecacuanha, and pyrethrum flowers,

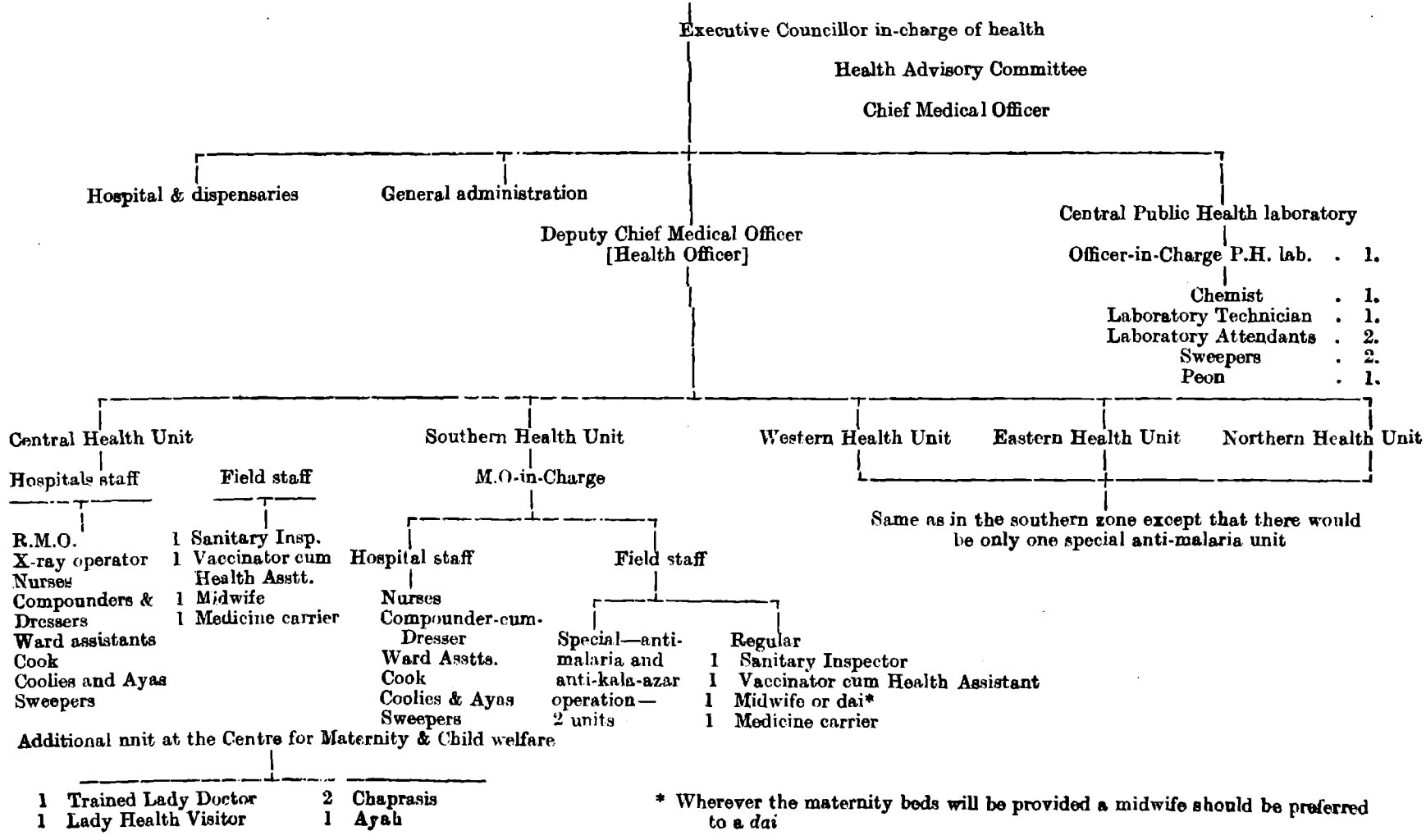
(*d*) introducing tea and coffee plantations and their production, and

(*e*) introducing cottage industries like weaving, basket-making, cane goods and leather industry, etc.

In the matter of collection of vital statistics, anti-malaria and anti-kala-azar campaigns and in introducting child welfare and maternity services, the voluntary services of the local people and particularly of the village Mondals will be essential.

The central Health unit should be utilised for the training of certain auxiliary personnel like—midwife, dai, ward assistants, laboratory attendants, etc.

The Organisation of the administrative Set up is presented diagrammatically below.



* Wherever the maternity beds will be provided a midwife should be preferred to a *dai*

Qualifications and Duties of the staff :—

(1) *C.M.O.*—A graduate in medicine with good experience of health administration, and preferably with D.P.H. qualification. He will be in overall charge of the administration and will act as the medical officer in charge of the Gangtok Hospital.

(2) *Deputy C.M.O.*—A graduate in medicine with D.P.H. qualification. He will be specially responsible for the running of the health units with all their functions and establishment. He may also be in charge of the tuberculosis annexe at the Gangtok Hospital and the Public Health Laboratory.

(3) *O/IC, P.H. Laboratory.*—He will be a graduate in medicine, with special training in bacteriology and if possible, nutrition and public health chemistry, and will be in charge of the Laboratory.

(4) *Chemist.*—A graduate in chemistry with experience in public health work. He will be under the direct supervision of the OIC, P.H. Laboratory.

(5) *Lady Doctor.*—At least an L. M. F. with special training in Maternity and child welfare work. She will be in charge of the maternity beds in the Gangtok Hospital and will run a well-baby and mother clinic and will organise the fields for M.&C.W. work in the central zone.

(6) *X-ray Operator.*—Should be a medical man specially trained in radiology. The assistant surgeon at Gangtok Hospital being already trained in such work, a technician may be put under him for the present.

(7) *Medical Officer-in-charge of the Unit.*—He should be a qualified medical man preferably trained in public health and will be in charge of the hospital or dispensary as well as of the overall charge of the entire unit and its operations including anti-malaria operations. He should also carry out school health work in his area.

(8) *Lady Health Visitor.*—will assist the Lady Doctor in running the clinic and in organising the field for maternity and child welfare work.

(9) *Midwife at the Centre.*—In the Central zone she will assist the Lady Doctor in running the maternity ward, as well as the clinic.

(10) *Midwife or Dai at other units.*—will look after the maternity beds when provided, but her main duties will be organising the field work.

(11) *Sanitary Inspector.*—He will be in charge of all public health work in the field including the anti-malaria operations for which he must take special training. His special assignment will be the collection of vital statistics, vaccination, health education, environmental and school sanitation work.

(12) *Vaccinator cum Health Assistant.*—He will assist the Sanitary Inspector in his duties.

All the public health staff and particularly the field staff are expected to carry out certain amount of health education.

APPENDICES I to IX.

APPENDIX I.—Zone and village with their estimated population.

APPENDIX II.—Map of Sikkim.

APPENDIX III.—Age and sex distribution of population surveyed by zones.

APPENDIX IV.—Distribution of occupation in the sample population by age groups.

APPENDIX V.—Total admissions due to various causes in the different hospitals and dispensaries in the state during 1952.

APPENDIX VI.—Hookworm Infestation by zones and communities (Tab. XXXIXa).
Roundworm Infestation by zones and communities (T. XXXIXb)
Tapeworm Infestation by zone and communities (T. XXXIXc).
Trichuris infestation by zone and communities (T. XXXIXd).

APPENDIX VII.—Schedules and keys.

APPENDIX VIII.—Average height and weight graphs by age & sex.

APPENDIX IX.—Pictorial views.

APPENDIX I.

Zones and Villages with their Estimated Population.

I. *CENTRAL ZONE—*

1. Gangtok	6,000
2. Burtok	500
3. Penlong	500
	7,000
Population covered by the survey. No.	544
%	7·8

II. *SOUTHERN ZONE—*

1. Rongpo	200
2. Duga	2,000
3. Majitar	90
4. Singtam bazar	300
5. Bardang	65
6. Sangsakim	500
7. Barmik Tokal	250
8. Barmik daring	200
9. Singlibon	20
10. Saku	200
11. Mapzi	150
12. West Pandom	200
13. Sumin	200
14. Sumin Linchey	100
15. Sirwani	50
16. Timitarkoo	700
17. Kartikey	12
	6,237
Population covered by the survey. No.	346
%	5·5

III. *WESTERN ZONE—*

1. Namchi bazar	750
2. Keytan	300
3. Assanthang	200
4. Sake Namchi	32
5. Gumba Namchi	90
6. Dhargaon	80
7. Poongdora	50
8. Timitaku	100
9. Bungtar Namchi	300
10. Salgari	350
11. Geyzing	200
12. Kewzing	300
13. Malabasi	1,000
14. Burikop	800
15. Mindo	500
16. Chumbung	1,000
17. Soreng Bazar	150
18. Chakung	3,000
	9,202
Population covered by the survey. No.	522
%	5·7

IV. *EASTERN ZONE—*

1. Rhenock bazar	400
2. Tarpin	300
3. Rorethang	35
4. Pakyong	1,500
5. Kartak	500
6. Amba	1,000
7. Damlakhan	110
8. Dickling	350
	4,195
Population covered by the survey. No.	198
%	4·7

V. *NORTHERN ZONE—*

1. Dikchu	35
2. Jangoo	150
3. Mangan Bazar	100
4. Chungtham	35
5. Chinapari	10
6. Lachen	400
	730
Population covered by the survey. No.	90
%	12·3
Total population of 52 villages.	27,364
Total population covered by the survey. No.	1,700
%	6.2

APPENDIX III.

Age and sex distribution of population surveyed by zones.

Zones.	Male.						Female.						Both Sexes.					
Age.	Central.	South-ern.	West-ern.	East-ern.	North-ern.	All zones.	Central.	South-ern.	West-ern.	East-ern.	North-ern.	All zones.	Central.	South-ern.	West-ern.	East-ern.	North-ern.	All zones.
0—4·9	16	18	17	6	—	57	21	20	25	9	4	79	37	38	42	15	4	136
5—14·9	155	71	185	37	14	462	132	44	67	31	12	286	287	115	252	68	26	748
15—24·9	89	30	67	26	11	223	32	35	32	13	8	120	121	65	99	39	19	343
25—34·9	16	27	39	14	8	104	18	20	16	13	4	71	34	47	55	27	12	175
35—44·9	18	26	21	17	13	95	12	9	12	9	6	48	30	35	33	26	19	143
45—	24	24	22	16	6	92	11	22	18	7	4	62	35	46	40	23	10	154
Not known	—	—	1	—	—	1	—	—	—	—	—	—	—	—	1	—	—	1
Total	318	196	352	116	52	1,034	226	150	170	82	38	666	544	346	522	198	90	1,700

APPENDIX IV.

Distribution of occupation in the sample population by age groups.

Occupation.	0—14·9.	15—24·9.	25 and above.	Total.
Priest	—	1	3	4
Liberal profession	—	11	17	28
Landlord	1	1	5	7
Clerks & other sedentery	—	4	15	19
At school	567	145	—	712
At home	288	51	98	437
Shop-keeper & shop Assts.	—	5	16	21
Cultivators	20	65	185	270
Traders	—	15	42	57
Domestic servants	4	19	20	43
Transport & other labours	—	16	28 (1 agri.)	44
Police	—	1	11	12
Military	—	—	1	1
Village Headman	—	—	1	1
Artisan	—	—	1	1
Miscellaneous	4	10	29	43
TOTAL	884	344	472	1,700

APPENDIX V.

Total admissions due to various causes of sickness in the different hospitals and dispensaries in the state during 1952.

Diseases.	Indoor.					Dispensary Attendance.										Grand total.	Relative proportion of admission.
	Gangtok.	Singtam.	Namchi.	Rangpo.	Total.	Gangtok.	Singtam.	Namchi.	Rangpo.	Soreng.	Geying.	Mangan.	Rhenock.	Dentam.	Phambong.	Total.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Accident including injuries snake bite, Poisoning & animal bite.	81	7	76	0	164	485	275	730	351	184	240	16	89	72	91	2,533	2,697	4·89
Anaemia	5	2	17	0	24	83	229	91	173	118	61	2	—	—	—	757	781	1·42
Appendicitis	0	0	1	0	1	—	1	—	—	—	—	—	—	—	—	1	2	0·004
Diabetes	0	0	0	0	0	2	0	11	—	—	—	—	—	—	—	13	13	0·023
Diarrhoea & Dysen. . . .	17	2	29	0	48	833	288	357	335	258	96	64	55	40	220	2,546	2,594	4·71
Digestive (others) . . .	42	2	18	0	62	1,101	674	957	1,023	373	215	486	90	464	157	5,540	5,602	10·17
Ear diseases	2	0	0	0	2	111	87	87	38	44	12	—	—	—	—	379	381	0·69
Eye diseases	2	0	0	0	2	316	107	90	83	47	96	—	47	41	69	896	898	1·63
Fever (others) . . .	4	0	0	0	4	231	404	95	—	32	5	25	135	17	178	1,122	1,126	2·05
Genito-urinary . .	16	1	12	0	29	39	34	157	42	17	5	—	—	—	—	294	323	0·72
Heart disease (including circulatory).	9	1	3	0	13	3	12	14	—	14	—	—	—	—	—	43	56	0·10
Ill-defined causes . .	11	—	6	—	17	122	139	—	—	—	—	—	—	—	—	221	278	0·50

Kalaazar	136	71	114	3	324	6	369	7	750	21	6	1	—	—	—	1,160	1,484	2·69
Kidney diseases	2	0	34	1	37	21	3	13	—	—	—	—	—	—	—	37	74	0·134
Liver diseases	14	1	5	0	20	57	50	8	—	15	97	2	—	—	—	229	249	0·46
Malaria	140	23	34	6	203	611	1,543	952	3,315	580	629	257	102	3(	148	8,173	8,376	15·22
Mental disorders	10	0	0	0	10	3	—	—	—	—	—	—	—	—	—	3	13	0·023
Nervous disorders	17	0	0	0	17	232	141	478	—	415	185	18	150	99	71	1,785	1,802	3·27
New growths	1	0	4	0	5	—	6	—	—	—	5	—	—	—	—	11	16	0·029
Nose	—	—	1	—	1	73	14	2	20	15	22	--	—	—	—	146	147	0·27
Pneumonia other respiratory	31	10	56	0	97	1,169	402	1,110	157	595	232	49	95	63	406	5,278	5,375	9·77
Rheumatic condi.	2	0	2	0	4	10	72	14	41	15	31	1	4	8	206	402	406	0·73
Ricket	0	2	0	0	2	—	9	—	—	—	—	—	—	—	—	9	11	0·020
Skin diseases	13	0	5	0	18	204	244	257	464	130	75	19	16	46	113	1,563	1,586	2·88
Smallpox	2	0	0	0	2	1	—	—	—	—	—	—	—	—	—	1	3	0·008
Tuberculosis lung	22	2	6	1	31	10	4	6	23	2	21	2	7	2	35	112	143	0·38
Tuberculosis (non-pulmonary)	16	0	7	0	23	—	9	35	—	1	—	—	—	—	—	45	68	
Typhoid & Paratyphoid	6	0	0	0	6	—	1	—	—	22	2	—	—	—	—	25	31	0·056
Ulcers including tropical ulcer	6	4	18	0	28	747	300	1,067	924	552	222	15	80	80	153	4,140	4,168	7·57
Venereal diseases	25	0	3	0	28	64	23	10	43	5	6	75	13	8	50	297	325	0·59
Worms	91	4	106	0	201	6,167	1,275	3,431	—	1,000	925	—	424	—	—	13,222	13,423	24·38
Other infective	23	1	0	0	24	92	212	2	62	420	225	27	8	58	501	1,607	1,631	2·97
Miscellaneous	32	1	6	0	39	187	96	—	413	118	2	—	47	3	59	925	964	1·76
TOTAL	778	134	563	11	1,486	12,980	7,023	9,981	9,257	1,993	3,416	1,054	1,362	1,087	2,457	53,560	55,046	100·209
GOITRE	0	0	0	0	0	380	654	1,860	1,962	155	375	40	311	193	224	6,154	6,154	—
GRAND TOTAL	778	134	563	11	1,486	13,360	7,677	11,841	11,219	5,148	3,791	1,094	1,673	1,280	2,681	59,714	61,200	—

APPENDIX VI.

Table XXXIX (a).

Hookworm Infestation by zones and Communities.

Zones.	Nepali.		Sikkimese.		Lepcha.		Tebetan.		Marwari.		Other Indians.		Total.	
	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+
Central	22	14 (63·6)	14	7 (70·7)	11	5 (45·5)	8	2 (25·0)	3	1 (33·3)	2	0	56	29 (51·8)
Southern	14	11 (78·6)	11	5 (45·5)	0	0	0	0	5	1 (20·0)	2	0	32	17 (53·1)
Western	58	42 (72·4)	19	3 (15·8)	7	3 (42·0)	0	0	13	3 (23·1)	5	0	102	51 (50·1)
Eastern	27	9 (33·3)	14	1 (7·1)	1	1 (100·0)	5	1 (20·0)	1	0	3	1 (33·3)	51	13 (25·5)
Northern	0	0	20	0	13	1 (7·7)	1	0	0	0	0	0	34	1 (2·9)
All Zones	121	76 (62·8)	74	16 (21·6)	32	10 (31·25)	14	3 (21·4)	22	5 (22·7)	12	1 (8·3)	275	111 (40·4)

APPENDIX VI.

Table XXXIX (b).

Roundworm infestation by zones and communities.

Zones.	Nepali.		Sikkimese.		Lepcha.		Tibetan.		Marwari.		Other Indians.		Total.	
	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+
Central	22	9 (40·9)	10	1 (10·0)	11	3 (27·3)	8	2 (25·0)	3	1 (33·3)	2	0	56	16 (28·6)
Southern	14	7 (50·0)	11	4 (36·4)	0	0	0	0	5	0	2	0	32	11 (34·4)
Western	58	25 (43·1)	19	4 (21·0)	7	3 (42·9)	0	0	13	2 (15·4)	5	0	102	34 (33·3)
Eastern	27	13 (48·2)	14	4 (28·6)	1	1 (100·0)	5	0	1	0	3	2 (77·7)	51	20 (39·2)
Northern	0	0	20	7 (35·0)	13	2 (15·4)	1	0	0	0	0	0	34	9 (26·5)
All Zones	121	54 (44·6)	74	20 (27·0)	32	9 (28·1)	14	2 (14·3)	22	3 (13·6)	12	2 (16·7)	275	90 (32·7)

N. B.—Figures in parenthesis are percentages.

APPENDIX VI.

Table XXXIX (c).

Tapeworm infestation by zones and communities.

Zones.	Napali.		Sikkimese.		Bhutanese.		Lepcha.		Tibetan.		Marwari.		Other Indians.		Total.	
	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+
Central	22	0	10	1 (10·0)	0	0	11	2 (18·2)	8	2 (25·0)	3	0	2	0	56	5 (8·9)
Southern	14	0	11	0	0	0	0	0	0	0	5	0	2	0	32	0
Western	58	1* (1·7)	19	10 (52·6)	0	0	7	1 (14·3)	0	0	13	0	5	0	102	12 (11·8)
Eastern	27	0	14	10 (71·4)	0	0	1	0 (80·0)	5	4	1	0	3	0	51	14 (27·5)
Northern	0	0	20	11 (55·0)	0	0	13	10 (76·9)	1	1 (100·0)	0	0	0	0	34	22 (64·7)
All Zones	121	1* (0·83)	74	32 (43·2)	0	0	32	13 (40·6)	14	7 (50·0)	22	0	12	0	275	53 (19·3)

APPENDIX VI.

Table XXXIX (d).

Trichuris infestation in Sikkim by zones and communities.

Zones.	Nepali.		Sikkimese.		Bhutanese.		Lepcha.		Tibetan.		Marwari.		Other Indians.		Total.	
	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+	No.	+
Central . . .	22	12 (54·6)	10	3 (30·0)	0	0	11	5 (45·5)	8	5 (62·5)	3	2 (66·7)	2	2 (100·0)	56	29 (51·8)
Southern . .	14	3 (21·4)	11	3 (27·3)	0	0	0	0	0	0	5	1 (20·0)	2	0	32	7 (21·9)
Western . .	58	14 (24·1)	19	4 (21·0)	0	0	7	0	0	0	13	2 (15·4)	5	1 (20·0)	102	21 (20·6)
Eastern . . .	27	0	14	0	0	0	1	0	5	0	1	0	3	0	51	0
Northern . . .	0	0	20	0	0	0	13	0	1	0	0	0	0	0	34	0
All Zones .	121	29 (24·0)	74	10 (13·6)	0	0	32	5 (15·6)	14	5 (35·71)	22	5 (22·7)	12	3 (25·0)	275	57 (20·7)

N. B.—Figures in parenthesis are percentages.

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH, CALCUTTA.

Village Schedule for a Rapid Health Survey of Sikkim, 1953.

1. Number .....
2. Location and distance from Hd. qrs .....

   Population :— M.———— F.———— Total———— Altitude.....
3. Health circle, if any .....
4. Approach (Topography) ....Climate.....
5. Distribution of houses .....
6. Postal communication .....
7. Water Supply .....
8. Agriculture .....
9. Trade .....
10. Village crafts .....
11. Religious institutions .....
12. Educational and cultural institutions .....
13. Animal keeping .....
14. Medical and Maternity attendance available .....
15. Sources of water supply for the village .....
16. Number of hours with water supply .....
17. Number of houses with latrine .....
18. Light arrangement .....
19. Period covered by snow .....
20. Period of rainfall .....
21. Fairs and festivals .....
22. Entomological flora and fauna—

    Mosquito—

    Sandflies—

    Ticks—

    Louse—

    Flea—
23. Rodents—

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH, CALCUTTA.

Family Schedule for a Rapid Health Survey of Sikkim, 1953.

1. Village or town.....
2. Family No.....
3. Date of visit.....
4. Head of family.....
5. Nature of family.....
6. Economic status.....Family income (monthly).....
7. Number of inmates: *Adult* *Children* *total*
   Male—
   Female—
8. Religion.....
9. Tribe.....
10. Language.....
11. Residential status.....
12. Birth place of the head of the family.....
13. Occupation of the Head of the family.....
14. Addiction—Nature and number.....
15. Immunisation history.....
16. Abortions, births and deaths (yr.).....
17. Sex of the deceased.....
18. Cause of death.....
19. Type of house.....
20. Space per person.....
21. Sleeping facilities.....
22. Heating and lighting facilities.....
23. Kitchen .....Type of fuel.....
24. Water supply .....Drinking and Domestic.....
25. Disposal of refuse and night soil.....
26. Diet and food habits.....
27. Maternity facilities.....
28. Medical assistance.....
29. Domestic animals.....
30. Insects.....
31. Rodents.....

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH, CALCUTTA.

Individual Schedule for a Rapid Health Survey of Sikkim, 1953.

1. Serial No.....

2. Family No.....

3. Village.....

4. Date of Exam.....

5. Sex.....

6. Age.....

7. Occupation.....

Wage earner.....Cause of unemployment.....

.....

.....

8. Marital status.....

9. Number of live births and children living.....

10. Disability, if any.....Cause.....

11. Present state of health.....Cause of sickness.....

.....

.....

12. Part sickness (Year).....Duration.....

Nature.....

13. Literacy.....Type of training.....

14. Haemoglobin per cent.....

15. Blood parasites.....

16. Stool parasites.....

17. Nutritional state.....

18 Spleen .....

Health habits.....

19 Other laboratory test, if any done.....

Clinical condition noted—

APPENDIX VII.

(a) *Key to General Individual Schedule (Sikkim, Health Survey).*

Occupation—Liberal profession, Landlord, Clerk and other sedentary, Priest, at School, at Home, Shopkeeper, Artisan, Cultivator, Trader, Hawker, Milk-man, Domestic servant, Washerman, Fisherman, Agricultural labour, Transport labour, Other labour, Vagabond or begger, Others, Police, Military, Village Headman, Sweeper, Barber, Cobbler.

Literacy—Illiterate, Just literate, Literate.

Type of training—Primary, Secondary, College, Technical, Modern, Traditional.

Disabilities—Nil, Partial deaf, Completely deaf, Deaf mute, Partially blind, Completely blind, Loss of limb including paralysis and paresis, Kypohosis.

Cause—Congenital, Accident, Disease, Old age, Any other.

State of Health—Well, Actually ill, Chronically ill, Indifferent.

Nutritional status—Defects found (enumerate)—

Vitamin A	Normal.	Slight.	Moderate.	Marked.
Vitamin B_1 . . .	,,	,,	,,	,,
Vitamin B_2 . . .	,,	,,	,,	,,
Vitamin B_3 (others) . .	,,	,,	,,	,,
Vitamin C	,,	,,	,,	,,
Vitamin D	,,	,,	,,	,,
Fe	,,	,,	,,	,,
Iodine	,,	,,	,,	,,
General	,,	,,	,,	,,

Health Habits—Bathing—Use of soap or oil.

Mouth and teeth, Bowels, Clothes, baths and nails, (write only what is practised).

APPENDIX VII—*contd.*

(b) *Key to Family and Environment Schedule (Sikkim, Health Survey).*

Nature of family—Single, Joint, Multi.

Economic status—Very poor, Poor, Middle, Rich.

Religion—Hindu, Buddhist, Christian, Muslim, Confucians, Jain, Sikhs, No specific religion, Others (specify).

Race—Lepchas, Sikkimese Bhutias, Tibetan Bhutias, Nepali Bhutias, Nepali, Marwari, Bihari, Punjabi, Bengali, other Indians.

Nepali Tribes—(*a*) Sherpas, Rais, Limbus, Gurungs, Mangars, Tamangs, Sunwars, Bhujil (Gharti), Thami, Newars (Pradhan).

(*b*) Bahum (Brahmin), Khettri, Sanyesi.

(*c*) Kami, Damai, Sarki.

Language—Lepcha, Sikkimese (Bhutia), Tibetan (Bhutia), Nepali.

Tribal dialect—Sherpa, Limbu, Newari, etc.

Residential status—Permanent, Temporary—Frequent, Infrequent—Visitor, others.

Addiction—Nil, Smoking, Alcohol, Opium, Charas, Bhang, Tobacco chewing, Cocaine, Others (specify).

Immunisation—Nil, Smallpox, Smallpox Revac., Typhoid, Cholera, Plague, Rables, Others (specify).

Births (during the year)—Abortion, Still birth, Live birth male, Live birth female.

Maternity attendance—Doctor, Midwife, Dai trained, Dai untrained, Relative, None.

Deaths (during the year)—Male, Female, Infant, Pre-school, School, Adult, Old, Resident, Non Resident.

Cause of death.

Medical attendance—Not available within 5 miles, Available and utilised, Available and not utilised.

Type of medical attendance available—Qualified private, Qualified dispensary, Homeopath, Ayurved, Unani, Quack, Folk Medicine, Others.

Type of housing—Hut, Wooden house, Pucca house, Temporary stone hut, Detached, Attached, Semi-detached.

Dampness—Dry, Damp, Leaky, Others.

Over-crowding—Floor space (Sq. ft. per person).

Ventilation—Good, Inadequate, Poor.

Lighting—Good, Inadequate, Poor.

Sleeping facilities—Wooden bed-stead, Machang, Floor.

Mosquito curtain—Used, Not used.

Heating arrangement—Present, Absent, Open fire.

Fire place—Charcoal fire, Others.

APPENDIX VII—*contd.*

(b) *Key to Family and Environment Schedule (Sikkim, Health Survey).*

Kitchen—Separate, Not separate.

Cow or animal-shed—Attached, Detached, Nil, Does not arise.

Water supply—Drinking—Spring, Well, Streamlets, Piped, Others, Adequate, Inadequate.

Bathing and Washing—Adequate, Inadequate.

Latrine—Provided and Used—Provided and not used, Not provided.

Type—Bucket, Hanging, Pit, Surface, Bore hole, Others (Specify).

Sanitary conditions—Good, Bad, Very bad.

Disposal—Does not arise, Scattered in field, Dumped, Buried, Composted.

Domestic animals and birds—Cow, Goat, Sheep, Pig, Ducks, Hens, Pigeons, Deer, Lamu, Horse, Donkey, Yak, Penny, Buffalo.

Insects present—Mosquito, Flies, Sand Fly, Bed bugs, Ticks, Cockroaches, Mites, Head louse, Body louse, P. irritans, Fleas, Others (Specify).

Rodent—Present, Absent.

Types—R. rattus, R. norvegious, B. bengalensis bengalensis, Gunomys Kok, Bandicoota, Mus Musculus (mouse), Musk Shrew, Gunomys varius, Others (Specify).

Diet—Rice, Wheat, Mixed, Vegetarian, Non vegetarian, Others.

APPENDIX VII—*concld.*

(c) *Key to Village Survey Schedule (Sikkim).*

Distribution of houses—Compact, In clusters, Along the road, Scattered, Widely scattered, Along the main road.

Altitude——1000 ft., —1500 ft., —2000 ft., —3000 ft., —4000 ft., —5000 ft., —6000 ft., —8000 ft., —10000 ft., etc.

Approach—Metalled road, Foot path, Hill-track, Winding lanes, Others (Specify).

Facilities of Postal communications—Present in the village, within 3 miles, within 5 miles, Beyond 5 miles, Almost absent or difficult, Nil.

Water supply—Drinking—Public, Piped, Private, Natural, Streamlets, Springs, Seepages, Collections in tanks, Available in the village within 1 mile, More than a mile away, Adequate, Inadequate.

Domestic—Public, Piped, Private, Natural streamlets, Springs, (bathing and washing) Seepages, Collection in tanks, Available in the village, Within 1 mile, More than a mile away, Adequate, Inadequate.

Collection and Disposal of night soil—Nil, Private Latrines, Public Latrines, Percentage of houses with latrines.
Disposal—Satisfactory, Unsatisfactory, Very unsatisfactory.

Climate—Temperature, Humidity, Rainfall, free month, if any.

Rainfall—total, period.

Snowfall—No fall in the year, Fall in winter only, 6m, 9m, perpetual snow.

Nature of agricultural products:—

Cereals—Maize, Rye, Barley, Wheat, Jawar, Millets, Buck-wheat, Others (Specify).

Pulses—Bengal gram, Black gram, Green gram, Lentils, Peas dried, Red gram, Soyabean, Horse gram, Others (Specify).

Fruits—Orange, Apples, Apricots, Peach, Pears, Plums, Nuts, Grapes, Banana, Pomegranate, Goosebery, Guava, Mangoes, Lichi, Jack fruit, Others (Specify).

Oil seed—Mustard, Gingelly, Linseed, Ghee, Butter, Dalda, Others (Specify).

Vegetables—Potato, Carrot, Cabbage, Cauliflower, Beet root, Tomato, Spinach, Gourd, Beans, Peas, Brinjal, Rhubarb, Celery, Lettuce, Amaranth, Sweet potato, Ladies-finger, Pumpkin, Turpin, Vegetable marrow, Onion, Squash Nebble, Bambooes shoots, Fern tops, Squash roots, Water cress, Yam (mane, pidalu).

Trade facilities—Market not present in the village, Present in the village, within 3 miles, within 5 miles, more than 5 miles.

Village crafts—Present, Absent, Nature.

Religious Institution—Absent, Present, Nature.

Cultural organisation—Nil, Primary School, Secondary School, Club, Playground, Folk dance.

Animal keeping—Nil, Poultry, Piggery, Goat keeping, Sheep herd, Ponny raising, Others (Specify).

Medical facilities—Available, Not available.

Fairs and Festivals—Name, period of the year, No. of people attending, Duration, Any epidemic later.

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH

List of Disease for "Causes of Death" and Sickness.

Institute Code Nos.	International Code Nos.	Name of the Disease.
1.	169-193 195-198	Accidental deaths other than snake-bite and animal-bite.
2.		Acute abdomen.
3.	36	Acute anterior Poliomyelities.
4.	40	Ankylostomiasis.
5.	7b, 7c.	Anthrax (N).
6.	161a	Asphyxia Neonatorum.
7.	68	Beri-Beri.
8.	160	Birth Injury.
9.	28	Black water fever.
10.	45-55	Cancer and Malignant tumours.
11.	88	Cataract.
12.	38e	Chicken Pox (N).
13.	4	Cholera (N).
14.	157-158	Congenital debility, Malformations, etc.
15.	38f	Dengue.
16.	61	Diabetes.
17.	27	Diarrhoeas and Dysentery (N) Amoebic, Bacillary, others.
18.	10	Diphtheria (N).
19.	89	Ear, Diseases and Mastoid Antrum.
20.	200a[2]	Epidemic Dropsy.
21.	88	Eye, other diseases of.
22.	200a[2]	Fevers, other.
23.	42	Filariasis.
24.	90-5	Heart diseases.
25.	33	Influenza with or without respiratory Complications.
26.	29.	Kala-Azar.
27.	23.	Leprosy.
28.	124-7	Liver diseases. (cirrhosis, Other diseases of liver, Biliary Calcul and Gallbladder disease).

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH—*contd.*

List of Disease for "Causes of Death" and Sickness—contd.

Institute Code Nos.	International Code Nos.	Name of the Disease.
29.	28	Malaria (All types).
30.	35	Measles (N).
31.	6	Meningitis (N) (Cerebrospinal).
32.	84	Mental disorder.
33.		Tropical Ulcer
34.	44c	Mumps (N).
35.	130-2	Nephritis and other diseases or urinary system.
36.	80-3, 85-7.	Nervous system— Other diseases of.
37.	25	Opthalmia Neonatorum.
38.	3	Plague (N) (Bubonic, septicaemic and Pneumonia).
39.	107, 108, 109.	Pneumonias (N) Broncho-pneumonia, Labour Pneumonia unspecified Poisoning (Alcoholism, others).
40.	77-9	Poisoning, (Alcoholism, others).
41.	140, 144, 147-8, 142-3, 145, 146, 149, 150.	Pregnancy and Childbirth diseases of.
42.	159	Prematurity.
43.	147b	Puerperal fevers.
44.	38b	Rabies.
45.	31	Relapsing fever (N).
46.	58,59	Rheumatic conditions.
47.	154-156	Rickets (Diseases of the bones).
48.	151-3	Scabies.
49.	162	Senility.
50.	151-3	Skin—Other diseases of.
51.	34	Small-pox (N).
52.	169-98	Snake-bite and bites of other wild animals.
53.	72, 74, 76	Spleen and blood—disease of.
54.	163, 164	Suicide.
55.	12	Tetanus.
56.	1156,2 or 3	Throat diseases including tonsillitis.
57.	88	Trachoma.

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH—*contd.*

List of Disease for "Causes of Death" and Sickness—contd.

Institute Code Nos.	International Code Nos.	Name of the Disease.
58.	13	Tuberculosis of respiratory system (N).
59.	14-22	Tuberculosis other than respiratory (N).
60.	1 and 2	Typhoid and paratyphoid fevers (N)-Specify.
61.	39	Typhus fevers (N).
62.	30	
63.	9	Whooping cough.
64.	112	Asthma.
65.	5	Undulant Fever.
66.	32	Yaws.
67.	42	Other diseases due to Helminths.
68.	7, 11, 24, 26, 37, 44.	Other infective parasitic diseases (Specify).
69.	56	Non-malignant Tumours.
70.	57	Tumours of Undetermined Nature.
71.	62-66	Diseases of endocrine glands.
72.	67	Scurvy.
73.	69	Pellagra.
74.	71	Other vitamin deficiency diseases.
75.	73	Anaemias.
76.	96-103	Other diseases of Circulatory System.
77.	106	Bronchitis.
78.	104, 105, 110-114.	Other respiratory diseases.
79.	117	Ulcer of the Stomach of Duedenum.
80.	119, 120	Enteritis and diarrhoea.
81.	121	Appendicitis.
82.	122	Hernia.
83.	115, 116, 118, 123, 128-9.	Other diseases of the digestive system.
84.	133-9	Nonvenereal diseases of the genito urinary system.

ALL INDIA INSTITUTE OF HYGIENE & PUBLIC HEALTH—*concld.*

List of Disease for "Causes of Death" and Sickness—concld.

Institute Code Nos.	International Code Nos.	Name of the Disease.
85.	165-8	Homicide.
86.	169-98	Other external causes (Nature to specify).
87.	199, 200	Other illdefined causes.
88.		Pediculosis.
89.		Goitre.
90.		Sciatica.
91.		Adenoid.
92.		Actinomycosis.
93.		Conjunctivitis.
94.		Tapeworm.
95.		Roundworm.
96.		Syphilis.
97.		Gonorrhoea.
98.		Piles.
99.		Caries.

APPENDIX IX.

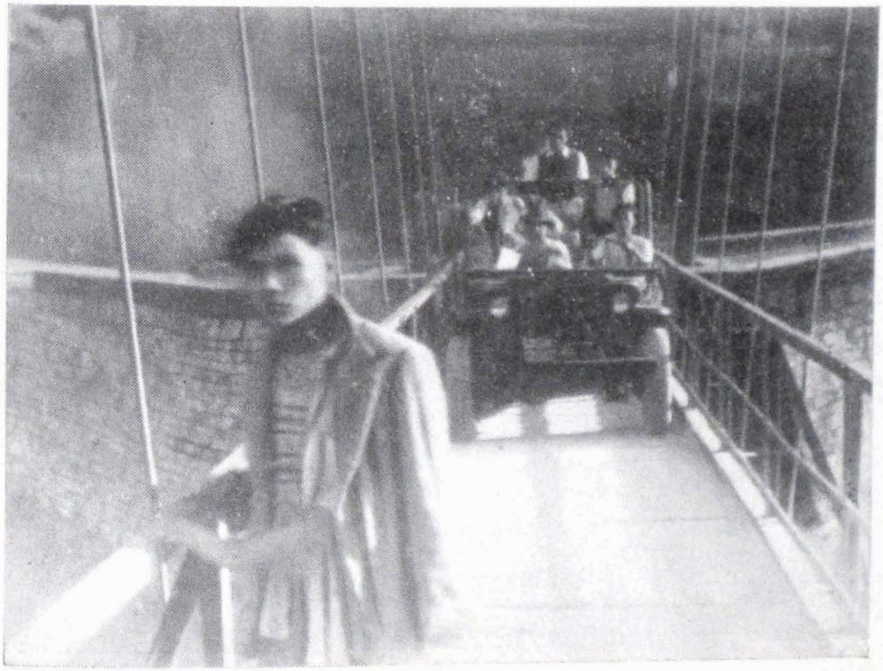
APPENDIX IX—*contd.*

VI. Community—*contd.* Page.

VII. The Survey Work—

Photographs taken by :— Dr. S. C. Seal and Sri P. Ghosh.

ON WAY TO GANGTOK—TEESTA BRIDGE.

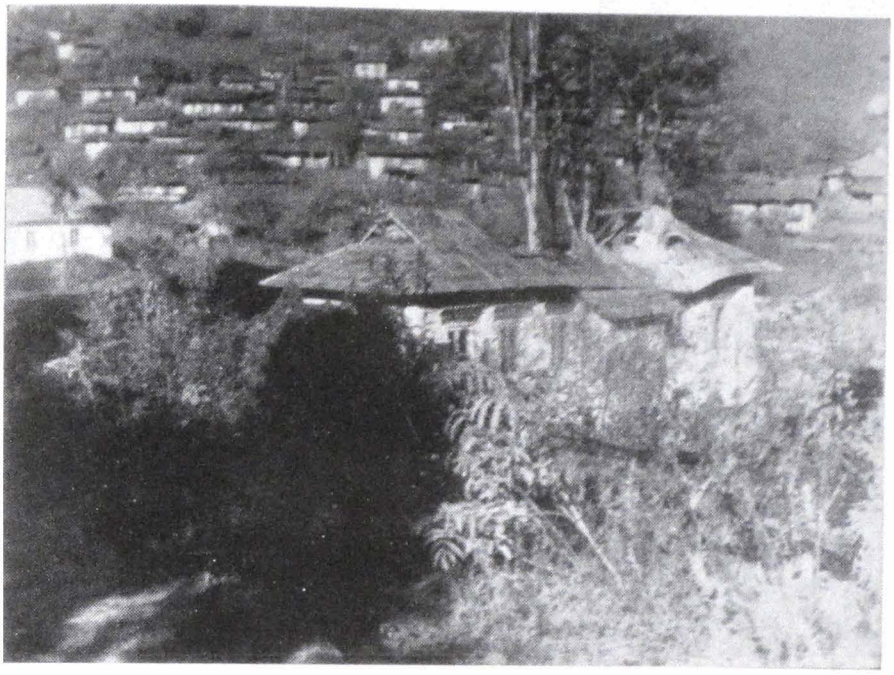


ON WAY TO RHENOCK—SUSPENSION BRIDGE JUST SUFFICIENT FOR A JEEP TO PASS.

ON WAY TO CHUNGTHAN—PARTY CROSSING A HILL STREAM OVER A BAMBOO BRIDGE.

ON THE ROAD TO CHUNGTHAN– PARTY NEGOTIATING A VERY DIFFICULT TERRAIN.

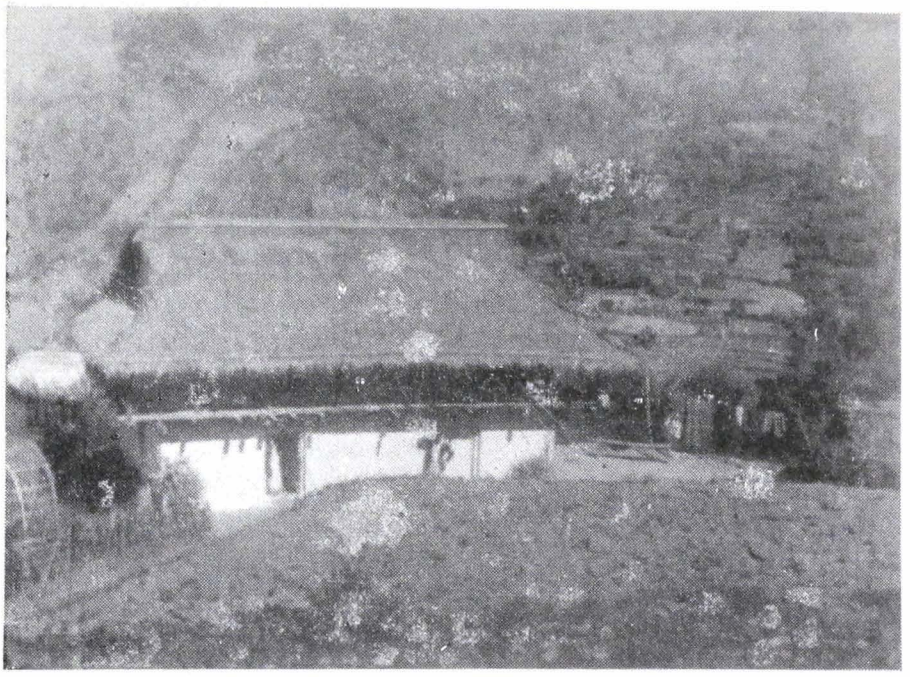
VILLAGE HOUSING AND BAZAAR



LACHEN—A COMPACT VILLAGE.

A TYPICAL BHOTIYA (SIKKIMESE) HOUSE—PEOPLE LIVE UPSTAIRS AND PIG BELOW.

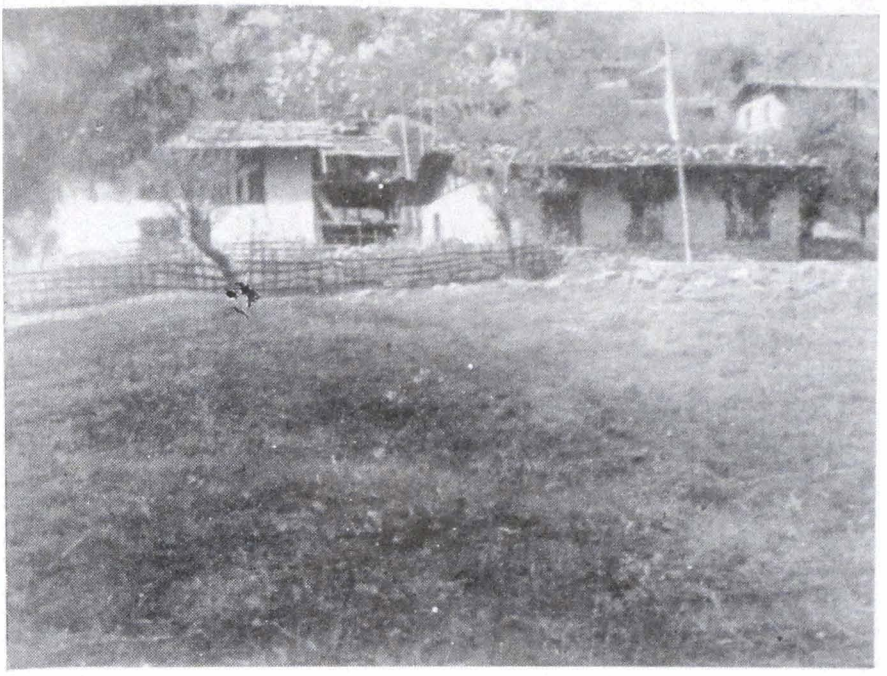
VILLAGE HOUSING AND BAZAAR—*contd.*



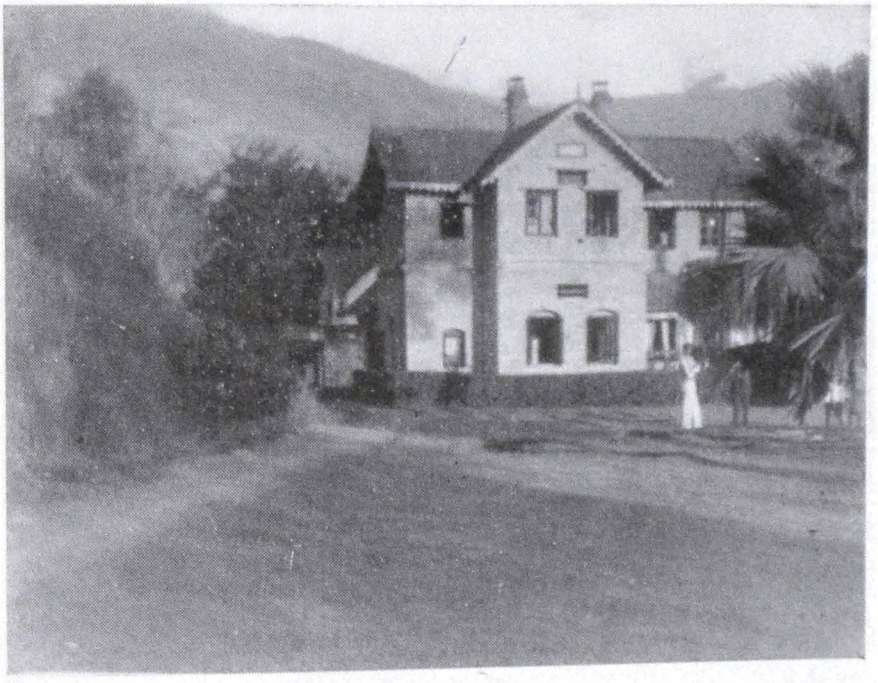
A TYPICAL NEPALI HOUSE WITH CATTLESHED ON THE LEFT—PEOPLE LIVE BELOW AND STORE THEIR PRODUCTS UPSTAIRS.

A POOR NEPALI HOUSE WITH CATTLE SHED ON THE LEFT.

VILLAGE HOUSING AND BAZAAR—*contd.*

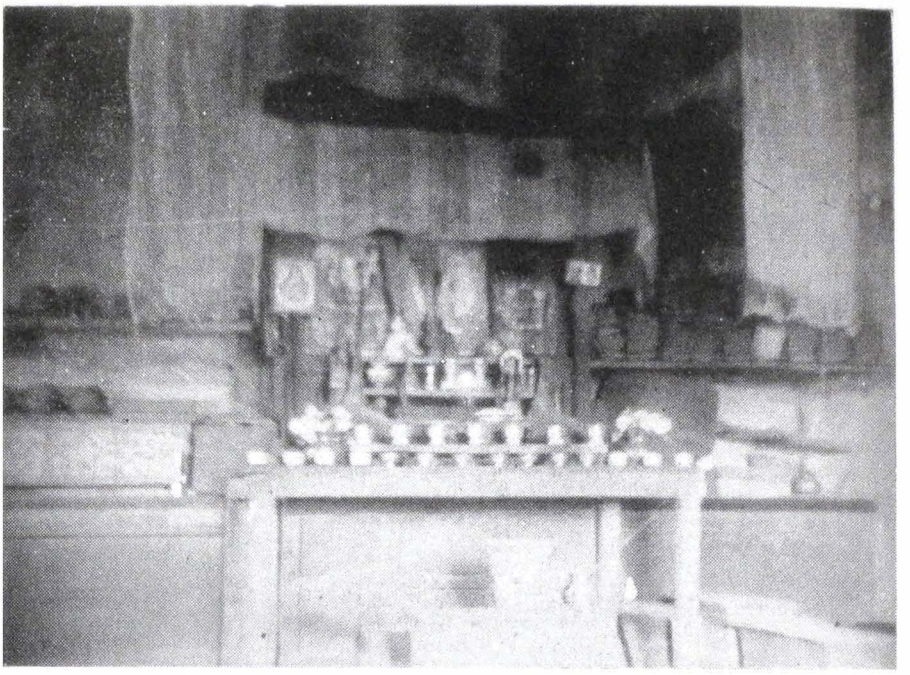


A TYPICAL HOUSE IN LACHEN WITH ORCHARD
AT THE BACKGROUND.

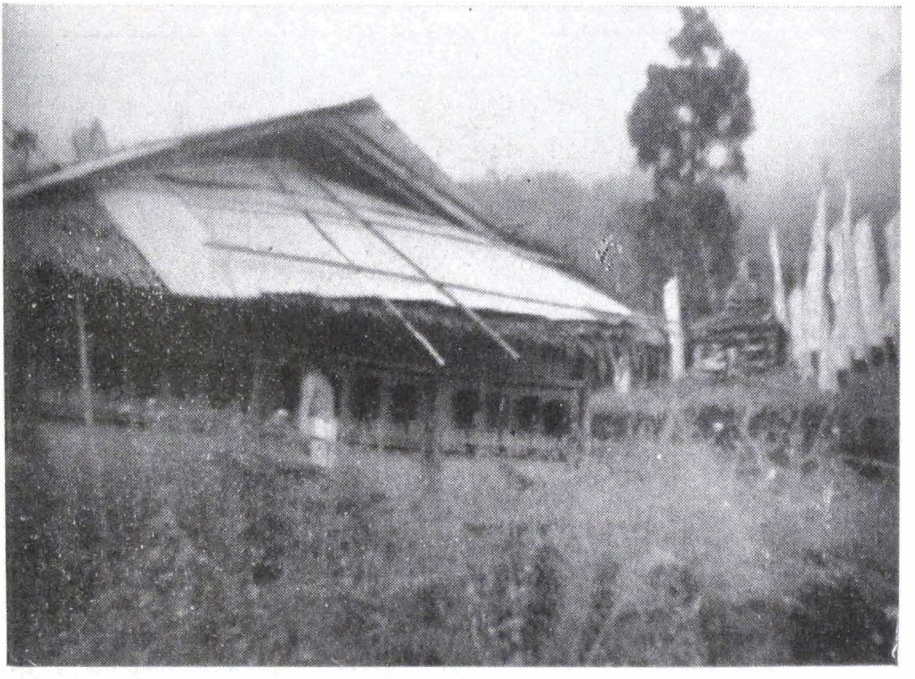


HOUSE OF A RICH NEPALI (PRADHAN AT RHENOCK).

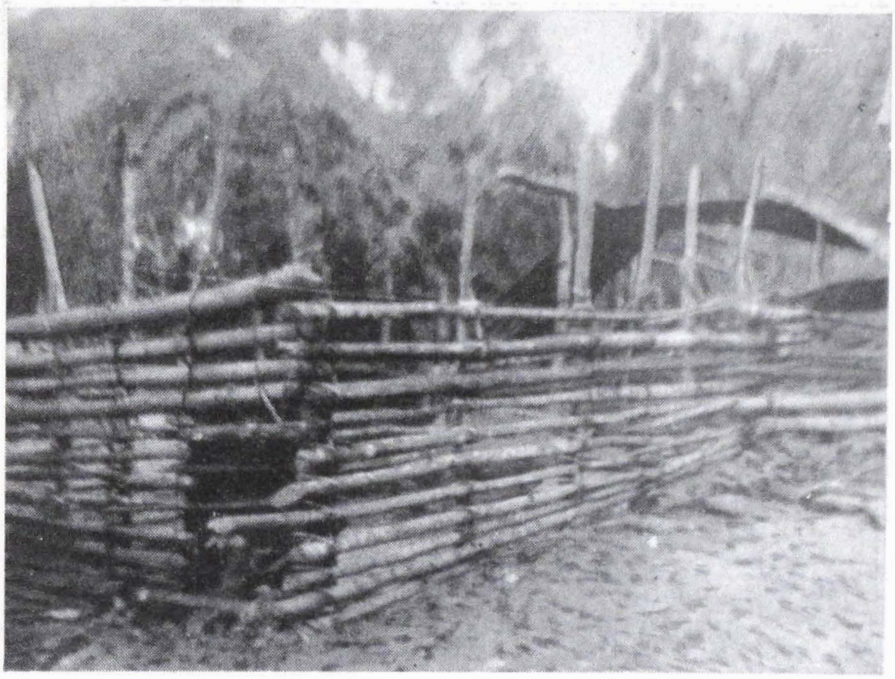
VILLAGE HOUSING AND BAZAAR—*concld.*



A PRAYER ROOM IN A BUDDHIST FAMILY.



A BUDDHIST MONASTERY (GUMPHA) SHOWING PRAYER WHEEL & FLAGS.



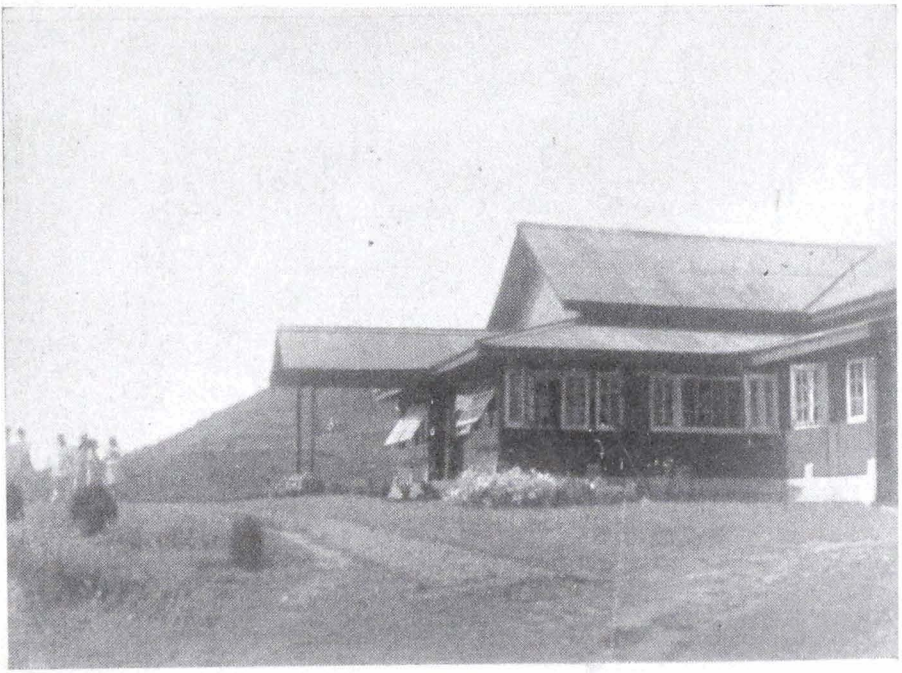
A TYPICAL PIGGERY IN PENLONG.

ASSAMLATA SHRUB AROUND A HUT.

ENVIRONMENT—*contd.*

DISTRIBUTION OF WATER THROUGH BAMBOO PIPE IN PENLONG BAZAAR.

HOSPITALS AND SCHOOLS



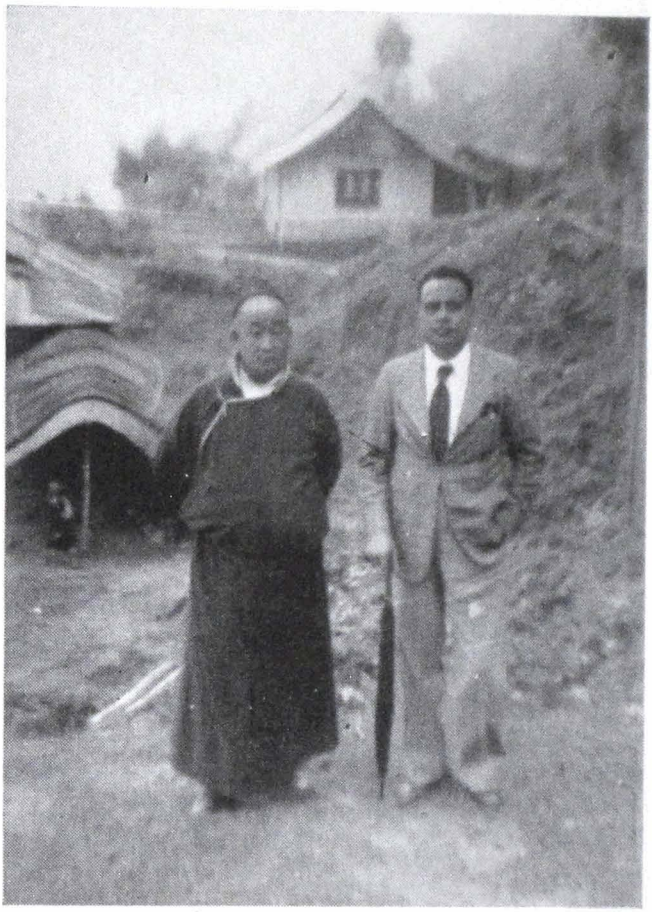
HOSPITALS AT NAMCHI.

A GROUP OF GIRLS STUDENTS AND TEACHERS IN THE GIRLS' HIGH SCHOOL AT GANGTOK.

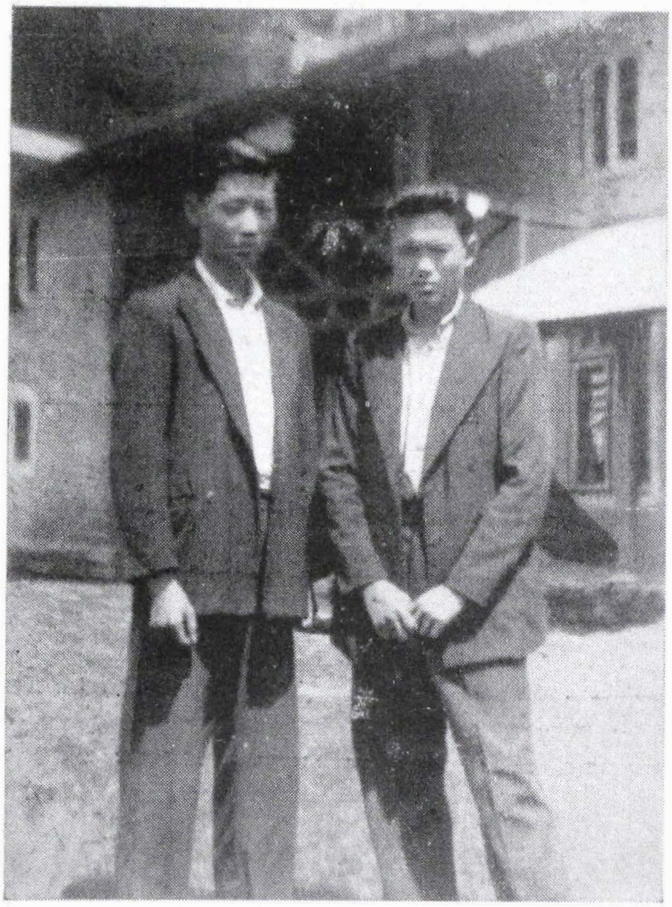
A GROUP OF HIGH SCHOOL BOYS AT GANGTOK WITH THE HEADMASTER (EXTREME LEFT).

THE PARTY WORKING IN PENLONG BAZAAR.

THE HAT DAY IN PAKYONG.



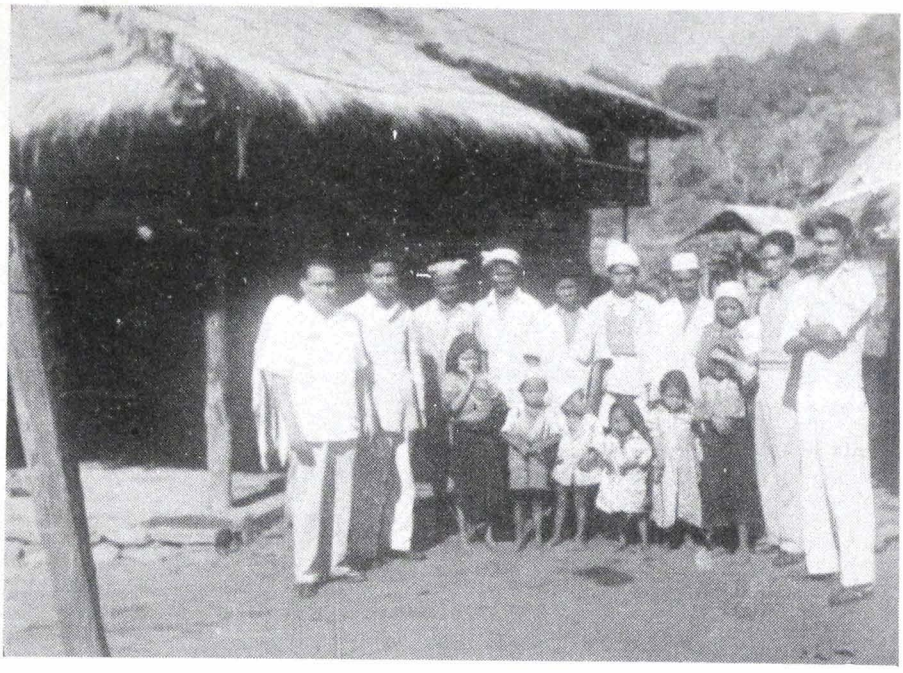
A TYPICAL SIKKIMESE (VILLAGE MANDAL) WITH THE ASSOCIATE PROFESSOR.



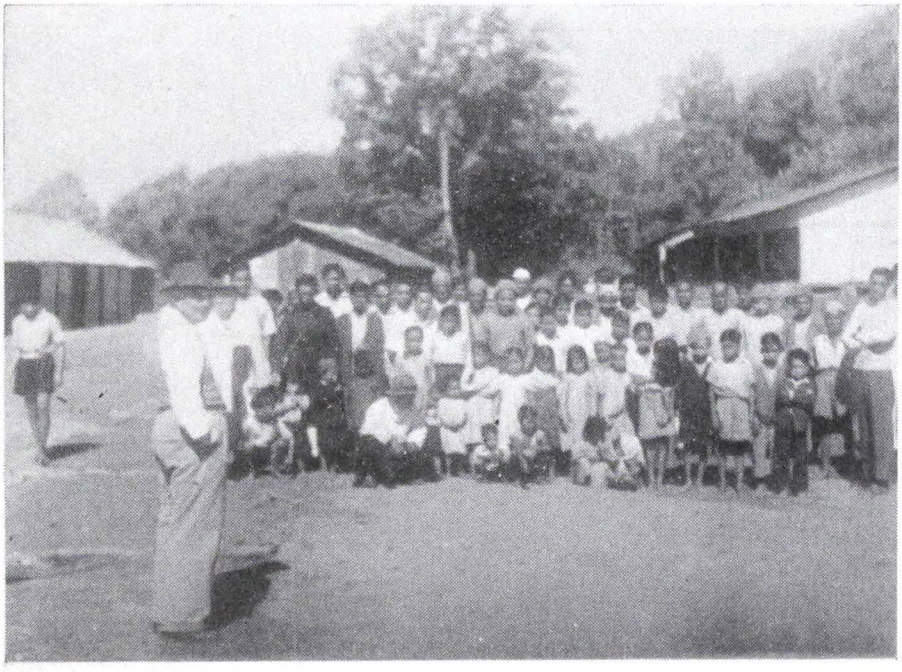
A PAIR OF TIBETAN SCHOOL BOYS.

A GROUP OF TYPICAL NEPALIS.

A GROUP OF LEPCHAS.



AT MAJITAR—A HIGHLY ENDEMIC AREA FOR KALAAZAR AND MALARIA.



AT RHENOCK BAZAAR—A GROUP OF PEOPLES COLLECTED FOR EXAMINATION.

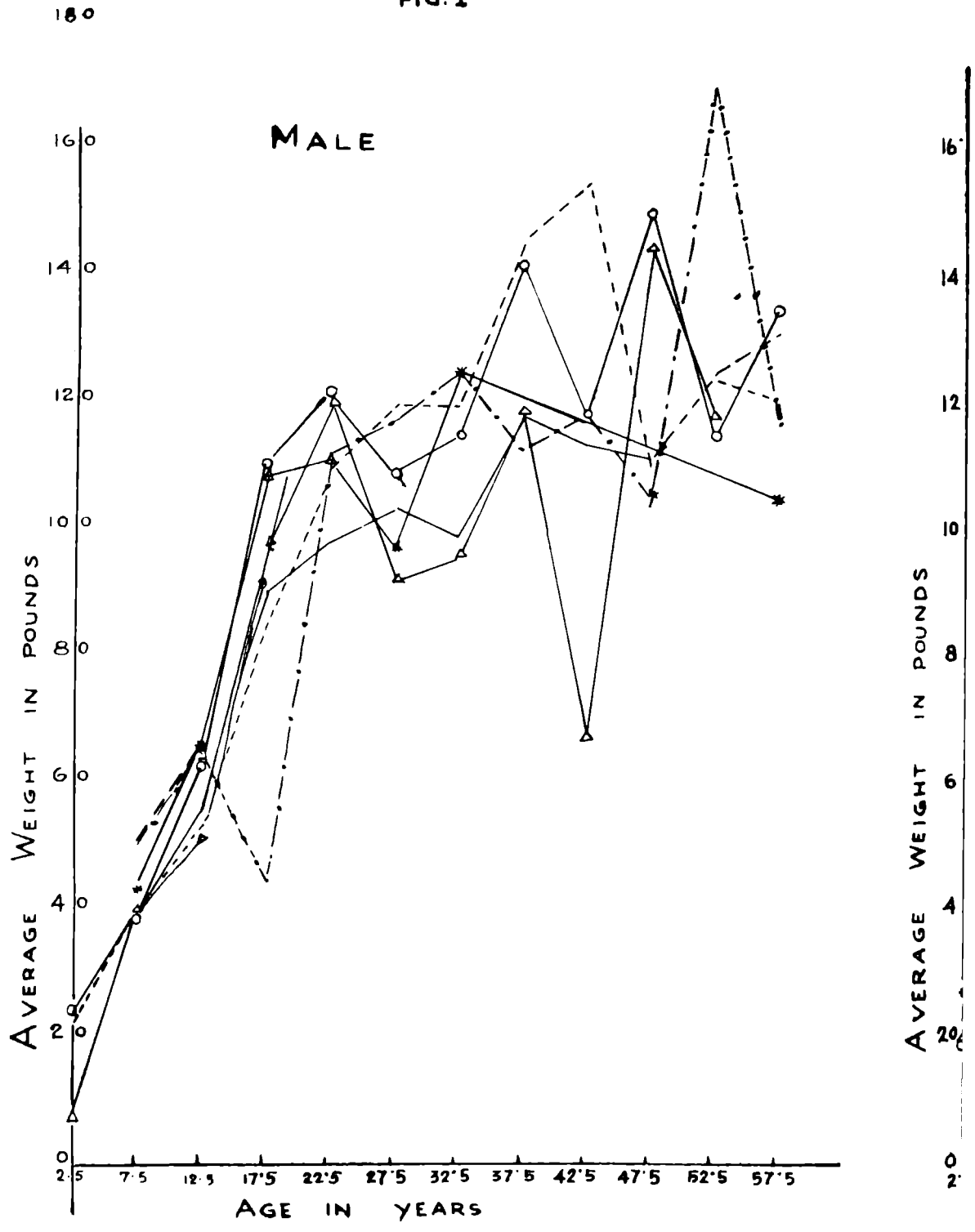
THE SURVEY WORK—*contd.*

AT LACHEN—TAKING BLOOD FOR EXAMINATION.

AT CHUNGTHAN—SPLEEN EXAMINATION.

AVERAGE WEIGHT IN DIFFERENT

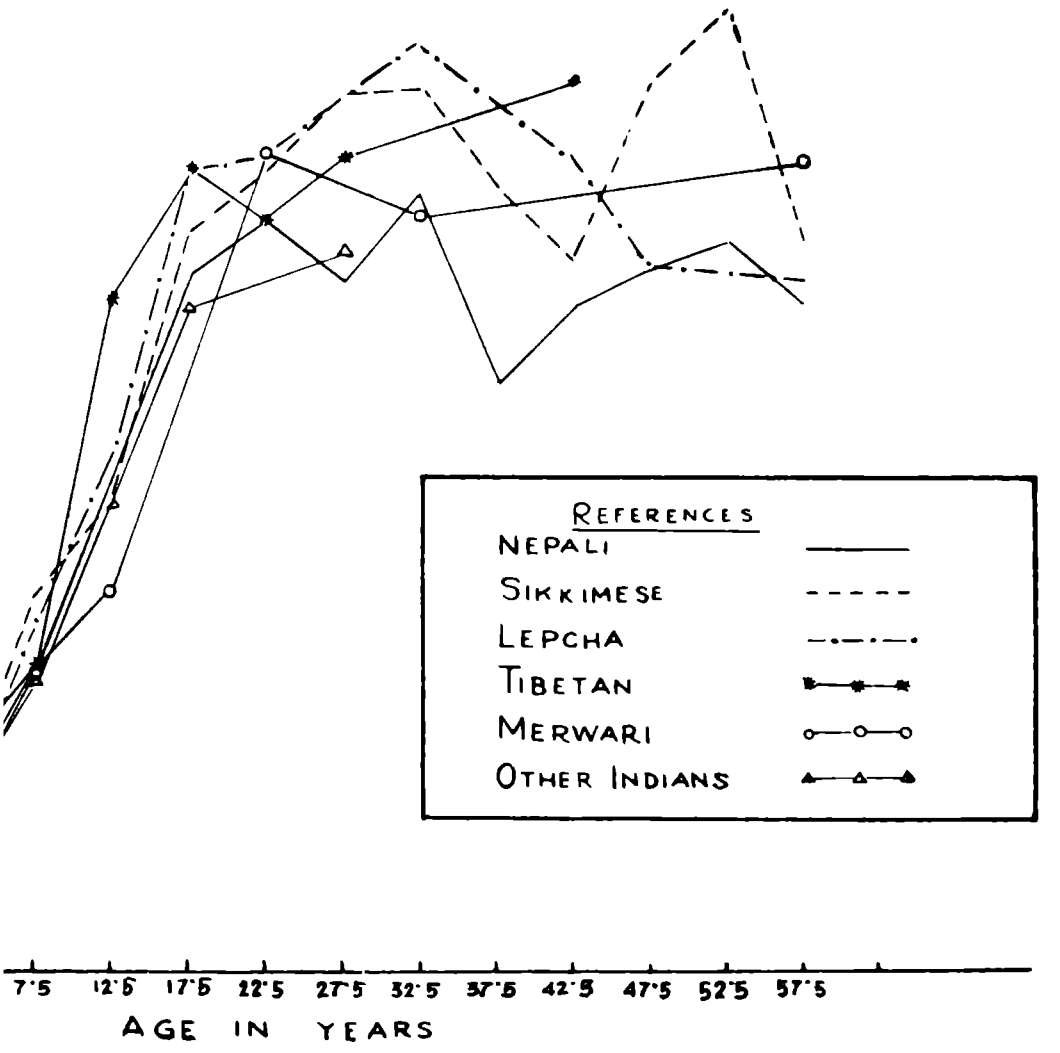
FIG. 1



COMMUNITIES BY AGE GROUPS

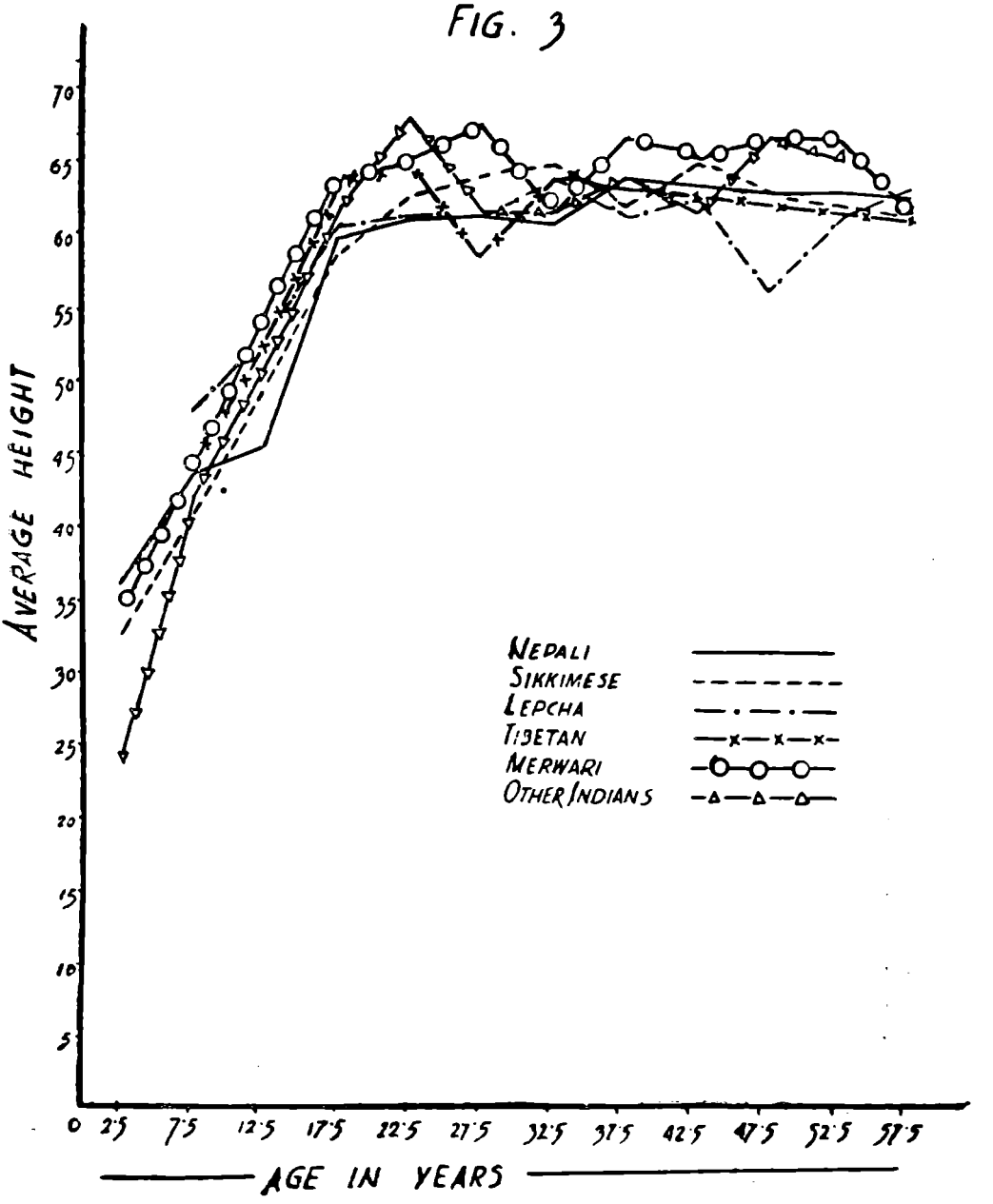
FIG. 2

FEMALE



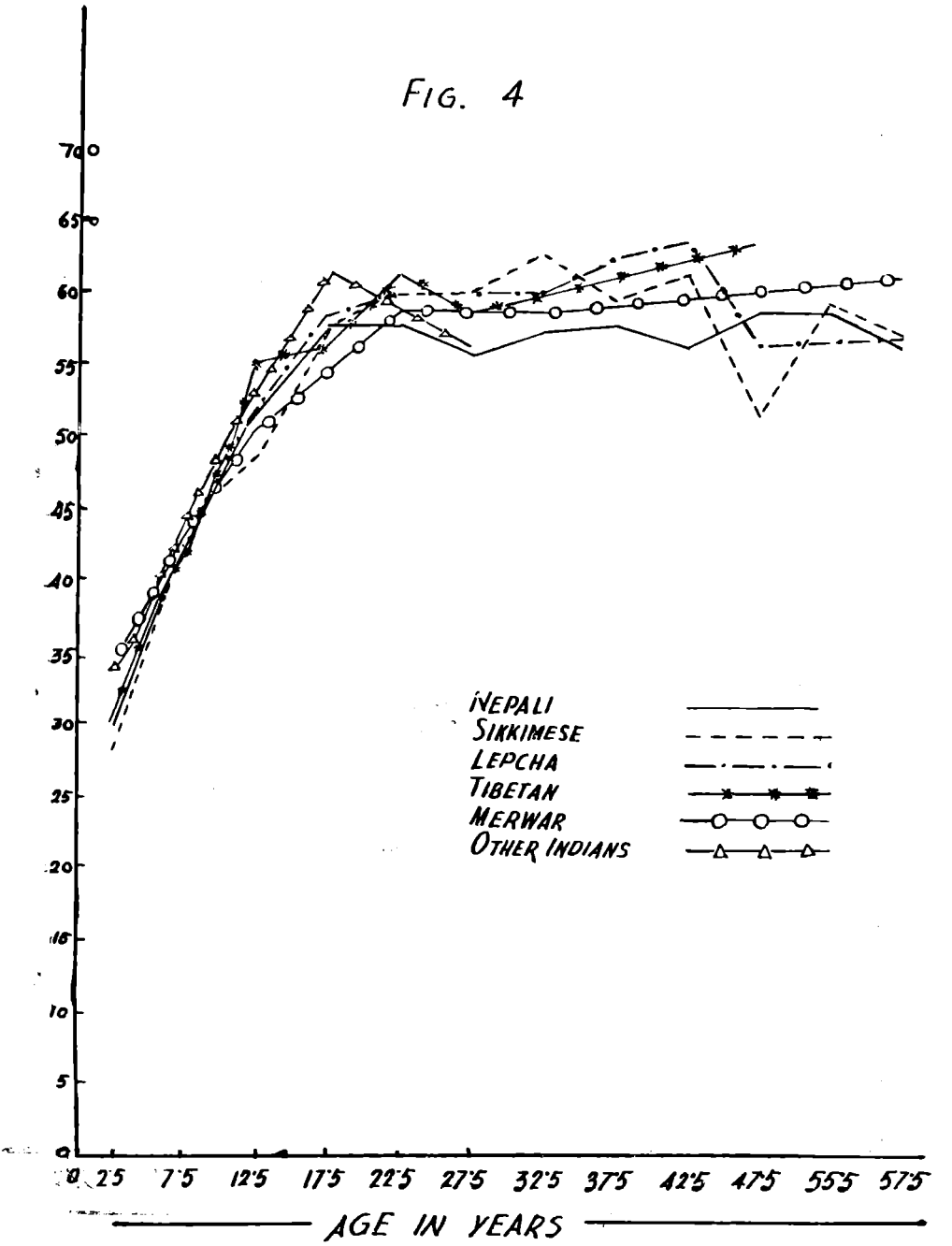
AVERAGE HEIGHTS (IN INCHES) OF MALES OF DIFFERENT COMMUNITIES BY AGE GROUPS

FIG. 3



—AVERAGE HEIGHTS (IN INCHES) OF FEMALES OF DIFFERENT COMMUNITIES BY AGE GROUPS—

FIG. 4



SIKKIM

APPENDIX-II